

1 **STATE OF NEW MEXICO**
2 **BEFORE THE ENVIRONMENTAL IMPROVEMENT BOARD**

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4
5 **IN THE MATTER OF PROPOSED REGULATION**
6 **20.2.350 NMAC – *GREENHOUSE GAS CAP AND***
7 ***TRADE PROVISIONS***

No. EIB 10-04 (R)

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11 **REBUTTAL TESTIMONY OF JONATHAN OVERPECK**
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14
15 **I. INTRODUCTION**
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18 **Q: PLEASE INTRODUCE YOURSELF AND TELL US ABOUT YOUR**
19 **BACKGROUND AND CURRENT WORK.**

20 A: My name is Jonathan Overpeck. My full curricula vitae is attached to this
21 testimony as NMED-Overpeck Rebuttal Exhibit 1. In addition to a Bachelor degree in
22 Geology, I received a Masters and PhD in Geological Sciences from Brown University in
23 1985. I currently hold several positions at the University of Arizona, including faculty
24 positions in the Department of Geosciences and the Department of Atmospheric
25 Sciences. I am a founding co-director of the Institute of the Environment, and the
26 founding director of the Translational Environmental Research Program, both at the
27 University of Arizona.

28 I have written more than 130 articles, papers, and book chapters related to climate
29 science, and regularly participate in climate-related workshops and forums around the
30 world. I was a Coordinating Lead Author of the Nobel Prize winning Intergovernmental
31 Panel on Climate Change's (IPCC) Fourth Assessment, and currently serve as a Lead
32 Author of the Chapter on Terrestrial and Inland Water Systems for the IPCC's Fifth

1 Assessment. For my work, I have received numerous awards, including the US
2 Department of Commerce Bronze and Gold Medals, as well as the Walter Orr Roberts
3 award of the American Meteorological Society. Since 1986, I have received over 30
4 multi-year grants, primarily from the National Science Foundation and NOAA, to
5 conduct research on climate change, including long-term climate variability and the
6 assessment of climate change in the southwestern U.S. Finally, I have served on advisory
7 boards to national bodies such as the National Science Foundation and NOAA, as well as
8 multiple studies of the National Academy of Sciences/ National Research Council. I have
9 also served on numerous university, national, and international committees concerning
10 science, climate change, sustainability, and environmental research. I am a Fellow of the
11 American Association for the Advancement of Science (AAAS), currently serve on the
12 Board of Reviewing Editors for *Science* magazine, and am a founding co-editor of *The*
13 *Edge* book series on Environmental Science, Law and Policy, a publication of the
14 University of Arizona Press.

16 **II. CLIMATEGATE**

17
18 **Q: SEVERAL WITNESSES, INCLUDING DR. CHRISTY, CONTEND THAT**
19 **THE STOLEN EMAILS KNOWN AS "CLIMATEGATE" CAST DOUBT**
20 **ON CLIMATE SCIENCE. WHAT DO YOU THINK OF THIS**
21 **CONTENTION?**

22 **A:** The 2009 theft of emails from the University of East Anglia Climatic Research
23 Unit (CRU) led to what has been dubbed "Climategate" by some members of the media,
24 as well as climate change deniers. The stolen emails were released to the public just prior

1 to the climate negotiations in Copenhagen, perhaps by coincidence, but the scientific
2 community was quick to highlight the negligible impact of these emails on the reality of
3 climate change. For example:

4 “The content of the stolen emails has no impact whatsoever on our overall
5 understanding that human activity is driving dangerous levels of global warming.”
6 *Union of Concerned Scientists Open Letter to Congress, December 4, 2009*

7
8 “No individual scientist in the IPCC assessment process is in a position to change the
9 conclusions, or to exclude relevant peer-reviewed papers and scientific work from an
10 IPCC Assessment Report.”
11 *IPCC Working Group 1, December 4, 2009*

12
13 “Stolen e-mails have revealed no scientific conspiracy, but do highlight ways in
14 which climate researchers could be better supported in the face of public scrutiny.”
15 *Nature Editorial, December 3, 2009*

16
17 “Even if some of the charges of improper behavior in this particular case turn out to
18 be true — which is not yet clearly the case — the impact on the science of climate
19 change would be very limited.” *Statement by the American Meteorological Society,*
20 *November 25, 2009*

21
22 And, not surprisingly, the charges of improper behavior proved to be false, and
23 these early assessments of negligible scientific impact turned out to be true. First came
24 several official investigations of the stolen emails, both in the UK and in the US. NMED-
25 Overpeck Rebuttal Exhibits 2, 3, and 4. These investigations culminated in July 2010
26 with the “Muir Russell” report which concluded:

27 Climate science is a matter of such global importance, that the highest
28 standards of honesty, rigour and openness are needed in its conduct. On
29 the specific allegations made against the behaviour of CRU scientists, we
30 *find that their rigour and honesty as scientists are not in doubt.*

31
32 In addition, we do not find that their behaviour has prejudiced the balance
33 of advice given to policy makers. In particular, *we did not find any*
34 *evidence of behaviour that might undermine the conclusions of the IPCC*
35 *assessments.*

36
37 NMED-Overpeck Rebuttal Exhibit 5 (emphasis in original).

1 Also in 2010, the U.S. National Academy of Sciences (NAS) – the most
2 prestigious scientific body in the nation - released several reports from its major
3 “America’s Climate Choices” study that support the findings of the 2007 IPCC reports
4 (excepting small errors that have no implications for climate change in New Mexico or
5 the Western United States as explained below). NMED-Overpeck Rebuttal Exhibit 6. The
6 same holds true for other recent climate science reports produced by the U.S. government
7 under both the G.W. Bush and Obama administrations. See
8 <http://www.globalchange.gov/publications/reports/scientific-assessments/saps>.

9 In particular, the NAS report entitled “Advancing the Science of Climate Change”
10 states:

11 There are still some uncertainties, and there always will be in
12 understanding a complex system like the Earth’s climate. Nevertheless,
13 there is a strong, credible body of evidence, based on multiple lines of
14 research, documenting that climate is changing, and that these changes are
15 in large part caused by human activities. While much remains to be
16 learned, the core phenomenon, scientific questions, and hypotheses have
17 been examined thoroughly and have stood firm in the face of serious
18 scientific debate and careful evaluation of alternative explanations.

19
20 The NAS continues:

21
22 Climate change is occurring, is caused largely by human activities, and
23 poses significant risks for – and in many cases is already affecting – a
24 broad range of human and natural systems. This conclusion is based on a
25 substantial array of scientific evidence, including recent work, and *is*
26 *consistent with the conclusions of recent assessments by the U.S. Global*
27 *Change Research Program (USGCRP, 2009a and others, the*
28 *Intergovernmental Panel on Climate Change’s Fourth Assessment Report*
29 *(IPCC, 2007a-d), and other assessments of the state of scientific*
30 *knowledge on climate change. (emphasis added).*

31
32 What all of these reports, both investigative and otherwise, are saying is that the
33 allegations of wrong-doing made by climate change deniers on the basis of the stolen
34 emails were, and are, unsubstantiated. In addition, these reports make it clear that the

1 scientific evidence, including the evidence produced after the 2007 IPCC Fourth
2 Assessment reports, does *not* invalidate the primary findings of the 2007 IPCC Fourth
3 Assessment as asserted by Dr. Christy. Moreover, these reports specifically address the
4 assertions made by Dr. Christy relating to the CRU global temperature analyses, and
5 make it clear that the CRU analyses are not biased or flawed, and that the CRU analyses
6 agree with findings of global temperature analyses made by other scientific groups, most
7 notably, NASA and NOAA in the United States.

8
9 **III. DR. CHRISTY'S DIRECT TESTIMONY**

10
11 **Q: DR. CHRISTY MAKES A NUMBER OF ASSERTIONS SUGGESTING**
12 **THAT CLIMATE SCIENCE IS UNCERTAIN, AND DOES NOT**
13 **SUPPORT A FINDING THAT HUMANS ARE CHANGING THE**
14 **CLIMATE. WHAT IS YOUR VIEW?**

15 **A:** The testimony offered by Dr. Christy is poorly informed by recent scientific
16 developments and the literature, and thus is misleading in terms of the current
17 understanding of climate change. In this testimony, I will provide evidence that climate
18 change is very real, that it is very likely caused by humans, and that the American
19 Southwest, including New Mexico, has substantial reason to be worried about climate
20 change.

21 Dr. Christy's testimony provides a misleading overview of what is known about
22 the so-called "Medieval Warming Period" and the implications of the so-called
23 "divergence problem" in tree-ring-based science. First, the argument that there was a
24 "Medieval Warm Period" comparable to the last 50 years of Earth's history has long been
25 challenged in the paleoclimatic literature. (The 2007 IPCC 4th Assessment, Working

1 Group 1, Chapter 6 has a nice overview of the topic.) The scientific process has revealed
2 that parts of the Earth were *colder* than the last 50 years during medieval times, and that
3 this finding is independent of any tree-ring study or possible “divergence” issue. Thus,
4 the so-called "Medieval Warming Period" is not relevant to the Dr. Christy's allegations,
5 and has been addressed in the scientific literature.

6 Dr. Christy cites several errors in the 2007 IPCC Fourth Assessment reports. Just
7 for perspective, these errors comprise only a fraction of more than 2,000 pages of
8 scientific assessment. These errors were thoroughly reviewed and found to have no effect
9 on the primary conclusions of the IPCC reports. NMED-Overpeck Exhibit 7. It is part of
10 the scientific process that errors are made, and then identified and corrected, just as it is
11 part of the scientific process that new science arises as time proceeds. In the case of
12 climate change, the basic "big picture" science is well-established, but many details
13 continue to be debated and updated. Dr. Christy should know that small errors in one part
14 of a large body of scientific knowledge seldom invalidate the entire body of knowledge,
15 and this certainly is the case with climate science. It is disingenuous and misleading to
16 suggest otherwise.

17 More to the point, the debate over Himalayan glaciers, Netherlands and sea level,
18 valuation losses from hurricanes, African agricultural production, risks to Amazon rain
19 forests and melting mountain ice – all cited by Dr. Christy as the errors found in the 2007
20 IPCC Assessment Reports – do not have anything to do with on-going and future climate
21 change in Western North America and New Mexico in particular.

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1 **IV. CLIMATE CHANGE IN THE SOUTHWEST**
2

3 **Q: WHAT IS HAPPENING TO THE CLIMATE OF THE U.S. WEST AND**
4 **SOUTHWEST, AND WHAT ARE THE IMPLICATIONS FOR THE**
5 **FUTURE?**

6 **A.** Recently, my colleague, Brad Udall of the University of Colorado, and I wrote a
7 short overview of climate change in the West – based on the peer-reviewed literature -
8 that appeared in the journal *Science*, and the big story is really in the Southwest. NMED-
9 Overpeck Rebuttal Exhibit 8. What follows is a summary of what we said about recent
10 climate change in *Science*.

11 First, like the globe, temperatures across the West are all rising; the region is
12 significantly warmer than the average during the 20th century (see **Figure 1**). In fact,
13 warming in the Southwest is as dramatic as anywhere else in North America, save
14 portions of the Arctic, where the warming is even more evident.

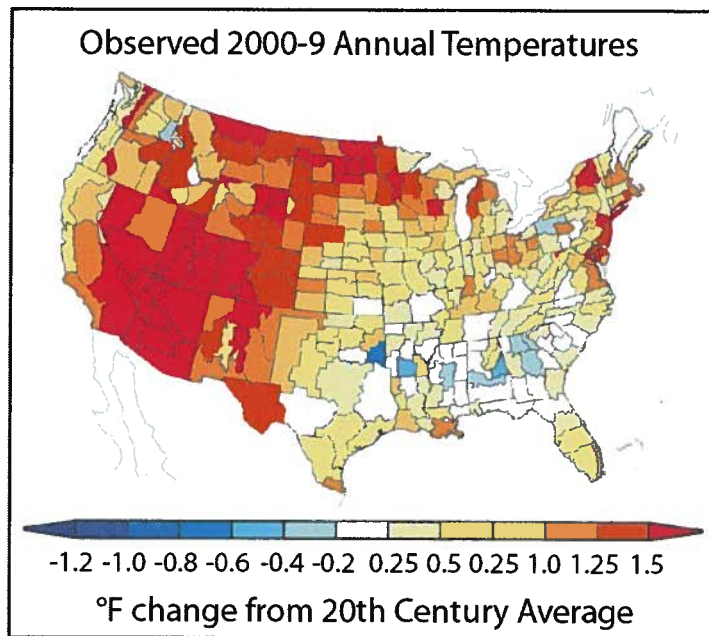


Figure 1. Mean annual temperature of the 21st century minus the average for the 20th century, mapped by climate division (From NOAA ESRL).

Second, this warming is having substantial impacts – including reduced late-season snowpack in the Colorado River headwaters - and contributing to the worst (and hottest) drought since the start of the 20th century. Combine this with a northward shift in winter storm tracks (a predictable response to a warming world), and you get significant reductions in the flow of the most important water source in the Southwest – the Colorado River. The two biggest reservoirs on the Colorado River - Lake Mead and Lake Powell - are now the most empty they have been since they both were first topped off back in the 1980's (**Figure 2**), and there has not been a substantial refilling since they began their precipitous decline in volume around ten years ago. Lake Powell has refilled slightly, but Lake Mead continues to drop.

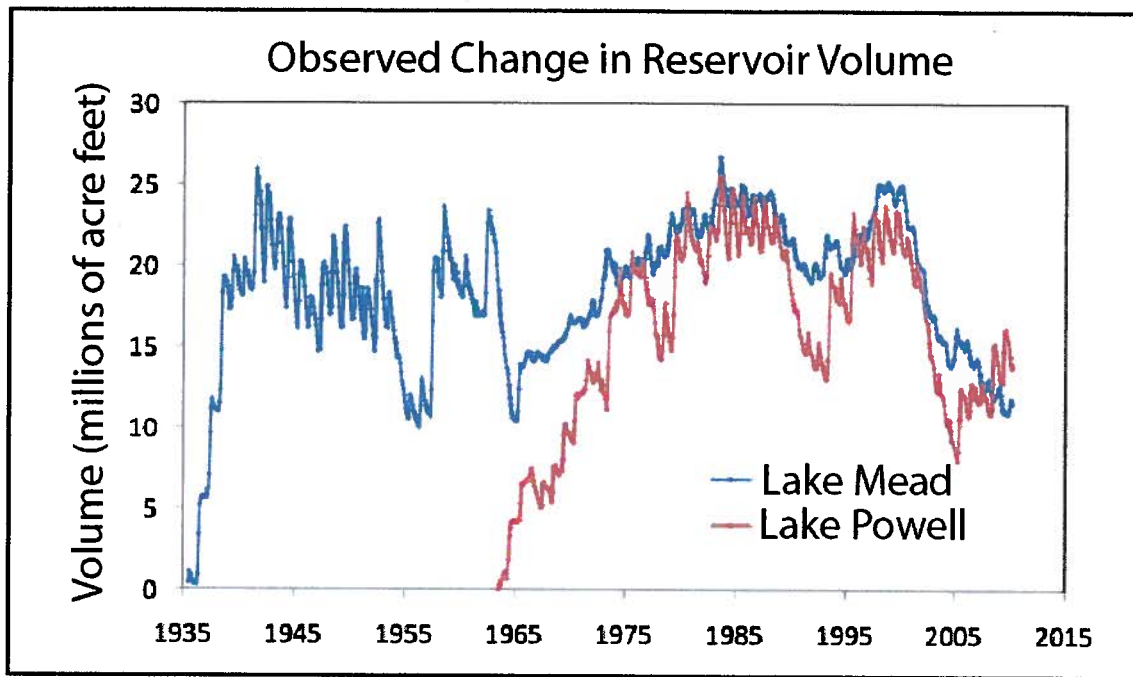


Figure 2. Observed changes in the volumes of the two largest reservoirs on the Colorado River, highlighting the dramatic (and still ongoing in the case of Lake Mead) drop in reservoir levels since the start of the 21st century western drought (data from U.S. Department of the Interior, Bureau of Reclamation).

The unprecedented warming and drought is also contributing to dramatic increases in vegetation death (see **Figure 3**) and large wildfires. Background tree death has increased significantly across the West. In the Southwest, my colleague Dave Breshears of the University of Arizona and others (2005) have documented that more than a million hectares of pinyon pine mortality – including in New Mexico - is linked to a record combination of warm temperatures and drought. Others scientists have begun to document how plant death due to recent drought also extends into the Southwestern deserts. Moreover, Westerling et al. (2006) recently documented a major upsurge in large wildfire across the West due primarily to the warming temperatures, and not just to the build-up of fuels due to decades of human fire suppression.

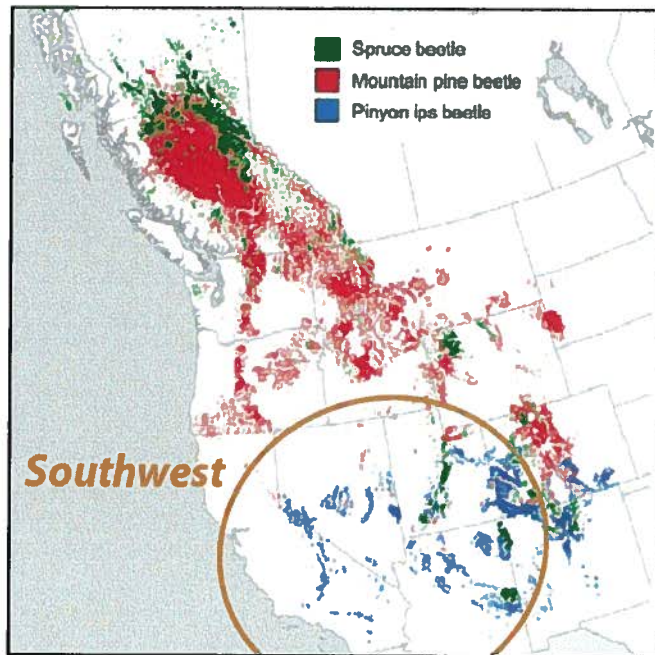


Figure 3. Recent mortality of major western conifer biomes due to bark beetles that has been linked in part to atmospheric warming (From Raffa et al., 2008).

What do all these dramatic changes mean? First and foremost, they give us a taste of what is at stake in the Southwest when it comes to climate change. All of the changes that I have just described, plus others we discuss in our *Science* paper, have either been linked to, or are consistent with, human-caused climate change. In fact, our region is one of the few regions of the world where recent climate and hydrological (i.e., temperature, snowpack and river flow) change can be attributed to human-caused climate change with statistical confidence (Barnett et al., 2008). Climate change is not a hypothetical issue for the Southwest. The projections made years ago are now coming true largely as expected, although perhaps at a rate that is faster than anticipated.

The agreement between climate projections and what is now actually occurring gives us more confidence in anticipating what is to come. And, by all serious accounts, what we've seen so far is just a small taste of what lies ahead. Although not all of the

1 change observed in the Southwest can be attributed formally to human-caused climate
2 change, it is consistent with what climate models and theory suggest should be happening
3 in response to human-caused climate change. Thus the current state of climate knowledge
4 indicates that the choice for policy-makers in the Southwest is likely between slowing the
5 rates of greenhouse gas emissions to the atmosphere, or planning on a hotter, more arid
6 Southwest, with all the associated impacts.

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11 **References Cited.**

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14 W. Wood, T. Nozawa, A. A. Mirin, D. R. Cayan, and M. D. Dettinger. 2008. Human-
15 induced changes in the hydrology of the western United States. *Science* **319**:1080-1083.

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17 Breshears, D. D., N. S. Cobb, P. M. Rich, K. P. Price, C. D. Allen, R. G. Balice, W. H.
18 Romme, J. H. Kastens, M. L. Floyd, J. Belnap, J. J. Anderson, O. B. Myers, and C. W.
19 Meyer. 2005. Regional vegetation die-off in response to global-change-type drought.
20 *Proceedings of the National Academy of Sciences of the United States of America*
21 **102**:15144-15148.

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23 Overpeck, J. and B. Udall. 2010. Dry Times Ahead. *Science* **328** 1642-1643.

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25 Raffa, K. F., B. H. Aukema, B. J. Bentz, A. L. Carroll, J. A. Hicke, M. G. Turner, and W.
26 H. Romme. 2008. Cross-scale Drivers of Natural Disturbances Prone to Anthropogenic
27 Amplification: The Dynamics of Bark Beetle Eruptions. *BioScience* **58**: 501-517.

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29 Westerling, A., H. Hidalgo, D. Cayan, and T. Swetnam. 2006. Warming and earlier
30 spring increase western US forest wildfire activity. *Science* **313**:940-943.

JONATHAN TAYLOR OVERPECK
CURRICULUM VITAE

ADDRESSES

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PERSONAL: Born June 29, 1957 in Iowa, USA.

EDUCATION

December 1985 - Ph.D. in Geological Sciences, Brown University, Rhode Island
June 1981 - MSc in Geological Sciences, Brown University
June 1979 - AB in Geology (Honors), Hamilton College, New York
Summer 1978 - Geologic Field Mapping in Montana, Indiana University

HONORS

2009 - Elected Fellow of the American Association for the Advancement of Science (AAAS)
2009 - Leading Edge Researcher Award, U. Arizona Office of Economic Development
2008 - NOAA Oceanic and Atmospheric Research Outstanding Scientific Paper Award
2007 - Nobel Peace Prize - contributed in leadership role as a Coordinating Lead Author of the Fourth Assessment of the Intergovernmental Panel on Climate Change (IPCC).
2007 - Shared winner of Atmospheric Science Librarians International's Scientific and Technical Category for "high impact comprehensive publication" for *Climate Change 2007: The Physical Science Basis*.
2005 - Bjerknes Lecturer, American Geophysical Union
2005 - John Simon Guggenheim Fellowship Award
2004 - Birbal Shani Institute of Palaeobotany, Lucknow, India Prof. T.M. Harris Medal for 2004 (awarded for best Indian co-authored paper in field in 2004)
2001 - American Meteorological Society's Walter Orr Roberts 2001 Award
1999 - US Department of Commerce Gold Medal
1996 - US Department of Commerce Outstanding Performance Award
1995 - National Geophysical Data Center Director Award
1994 - US Department of Commerce Bronze Medal
1992 - US Department of Commerce Outstanding Performance Award
1991 - US Department of Commerce Unusually Outstanding Performance Award
1979 - Sigma Xi
1978 - Hamilton College Senior Fellowship

PROFESSIONAL APPOINTMENTS

2009-present - Founding *Co-Director*, Institute of the Environment, Univ. of Arizona, Tucson
2006-present - Founding *Director*, UA Translational Environmental Research Program and associated UA Technology and Research Initiative Fund (TRIF).
2006-present - *Affiliated Faculty Member* - James E. Rogers College of Law, Univ. of Arizona, Tucson

2004-present -- *Joint Professor*, Dept. of Atmospheric Sciences, Univ. of Arizona, Tucson
 1999-2008 -- *Director*, Institute For Study of Planet Earth, Univ. of Arizona, Tucson
 1999-present -- *Professor*, Dept. of Geosciences, Univ. of Arizona, Tucson
 1992-00 -- *Adj. Assoc. Professor*, Dept. of Geological Sciences, University of Colorado
 1990-9 -- *Fellow*, Institute for Arctic and Alpine Research, Univ. of Colorado
 1992-9 -- *Director (and Founder)*, World Data Center for Paleoclimatology, Boulder, Colorado
 1990-9 -- *Head (and Founder)*, NOAA Paleoclimatology Program, NGDC, Boulder
 1991-7 -- *Adjunct Research Scientist*, Lamont-Doherty Geological Observatory,
 1986-90 -- *Associate Research Scientist*, Lamont-Doherty Geological Observatory
 1985-86 -- *Post-doctoral Res. Scientist*, Lamont-Doherty Geological Observatory
 1985 -- *Teaching Fellow*, Stratigraphy and Sedimentation, Brown University
 1980-84 -- *Research Assistant*, Brown University
 1979 -- *Teaching Assistant*, Mineralogy, Brown University
 1979 -- *Geologist*, U.S. Geological Survey, Menlo Park, California
 1977 -- *Field Assistant*, AMAX Exploration, Helena, Montana

PRIVATE-SECTOR PARTNERSHIPS and TECH TRANSFER

2006 – *present* - *Climate Appraisal Services LLC* – lead science partner
 2006 – Competed Options Agreement, as well as Technical Information License Agreement, between
Climate Appraisal Services and The Arizona Board of Regents on behalf of The University of
 Arizona
 2006 – Launched *Climate Appraisal Services LLC* at *ClimateAppraisal.com* - the first address-based
 service for climate and environmental risks.

GRANT AWARDS (Not including NOAA 1991-99)

2010-2015 – NSF “*IGERT: Rapid Transitions: Science for decision-making in the face of abrupt
 environmental change.*” – 5 years - (PI With 4 others). *Pending.*
 2008-2009 – Science Foundation Arizona – “*Assessing the threat to Arizona sustainability posed by long-
 term monsoon failure*” – 1 year – \$97,000 Co-PI with J. Cole).
 2008 – Qatar Foundation. *The Qatari Initiative for Solar Power and Desalinization* A proposed
 partnership with the University of Arizona submitted by invitation (Co-PI with 4 others) *Pending.*
 2007-2008 – NOAA “*Reconciling Projections of Future Colorado River Stream Flow*” – 1 year -
 \$250,000 (Co-PI with 7 others at several institutions)
 2007-2012 – NOAA “*Integrating Climate Science for Decision-Support, Mitigating Risk and Promoting
 Resilience*” – 5 years - \$4,899,080 (PI with 8 other UA Co-PIs)
 2007-2009 – NOAA “*Variability in the Eastern Equatorial Pacific Climate, ENSO and North American
 Drought Impacts over the last 2000 years*” – 2 years - \$96,832 (UA component; Overpeck is project
 PI of overall project)
 2006-2009 – NSF “*Collaborative Research: High-resolution, Low-Latitude Paleoclimatology From
 Newly Acquired Sediment Drill Cores from Lake Bosumtwi, Ghana*” – 3 years - \$244,687 (UA
 component)
 2006-2008 – NSF “*Paleoclimatic Change, Landscape Evolution, and Cultural transformations in Far
 Western Tibet, 2500 BP-present*” – 3 years - \$725,789 (Co-PI with 5 others, including Prof. Jon
 Pelletier).
 2005-2009 – NSF “*Collaborative Research: A Synthesis of the Last 2000 Years of Climatic Variability
 from Arctic Lakes*” – 4 years - \$1.85M (Co-PI with 12 others).
 2004-2005 – NSF “*Collaborative Research: High-Resolution, Low-Latitude Paleoclimatology Through
 Scientific Drilling of Lake Bosumtwi, Ghana,*” – 1.5 years. \$677,889 (Co-PI with three others).

- 2004-2006 – NSF “Management of Ecosystems in the US Southwest and Related Areas of Northern Mexico in the Context of Complex Uncertainties” – 1 year - \$77,500 (Decision making under uncertainty planning proposal, Co-PI with 4 others).
- 2003-2005 – NSF “Acquisition of an analytical facility for high-resolution paleoclimatology” – 3 years – \$339,915 (Co-PI with 4 others).
- 2002-2005 – ARCUS “ARCSS Committee Chair Support” – 3 years - \$54,000/year (PI)
- 2002-2006 – NSF “ITR: Development of an enhanced computer assisted analysis system for earth science: investigation of laminated sediments and tree rings” – 3 years – \$436,480 (PI with 2 others).
- 2002-2004 – NSF “Varved Records of Decade- to Century-Scale Climate Variability in the Tropical Atlantic Sector” – 2 years - \$167,000 (PI with 1 other).
- 2002-2004 – NSF “Scientific Drilling at the Bosumtwi Impact Structure, Ghana, West Africa” – approx. 3 years - \$1,200,000 (CoPI with 3 others).
- 2002-2007 – NOAA “Climate Assessment for the Southwest Project (CLIMAS)” – 5 years - \$5,437,806 (PI with 12 others).
- 2000-2003 – EPA “Climate and human contributions to fire affecting ecosystems in the U.S. Southwest” – 3 years - \$1,260,993 (Co-PI with 5 others)
- 2000-2005 - Multiagency “Desert Southwest Cooperative Ecosystem Study Unit (DS-CESU) – cooperative agreement – no set award amount (multiple CoPI’s)
- 2000-2002 – National Science Foundation Grant ATM “Century-scale variability in the Asian southwest Monsoon” 2-years - \$119,402 (PI with J.Cole)
- 1998 to 2001 - National Science Foundation Grant ATM-98100254 “Lake Bosumtwi, Ghana: High-resolution paleoclimatology and seismic reflection site survey” 3-years - \$518,944 (PI with C. Scholz)
- 1997 to 2000 - National Science Foundation Grant ATM-97 “Radiocarbon, Ocean and Climate Changes over the Last Deglaciation” 3-years - \$300,000 (Co-PI with K. Hughen and S. Lehman)
- 1997 to 2001 - National Science Foundation Grant ATM-PALE 9709918 “ Labrador Sea variability over decade to millennial time-scales” 4-years - \$564,000 (PI with G. Miller)
- 1997 to 2000 - NASA Grant LCLUC-0003: Assessing Future Stability of U.S. High Plains Landcover: Integration of Process Modeling with Landsat, In Situ Modern and Paleoclimate Data” 3 years - \$530,000 (PI with 4 Co-PIs)
- 1996 to 1999 - National Science Foundation Grant ATM-9631282: "Climatic Change of the Last 500 Years: Simulations versus Data" 3 years - \$270,000 (PI)
- 1995 to 1997 — NASA Graduate Student Fellowship in Global Change Research: "A 14,000 Year Record of Decade- to Century-scale Tropical Climate Variability from Annually-laminated Sediments of the Cariaco Basin, Venezuela" 2 years - \$44,000 (funds graduate student Konrad Hughen).
- 1995 to 1997 — National Science Foundation Grant OCE-9521058: "Interannual to Century-scale Variability in the Tropical Caribbean/ Western Atlantic: Varve-based Reconstructions from the Anoxic Cariaco Basin" 2 years - \$52,000 (PI).
- 1994 to 1997 — National Science Foundation Grant ATM94-02657: "A PALE Lake Sediment Calibration Network for the Eastern Canadian Arctic" 3 years - \$350,000 (PI with G. Miller).
- 1993 to 1996 — National Science Foundation Grant ATM-930072: "Eastern Arctic Climate of the Past 2,000 years: The Lake Sediment Record." 3 years - \$262,000 (PI with R. Anderson).
- 1991 to 1994 — National Science Foundation Grant ATM-9006307: "Project ARRCC - Analysis of Rapid and Recent Climatic Change." 3 years - \$720,000 (PI with 5 others).
- 1991 to 1994 — National Science Foundation Grant ATM-9019023: "Paleoecologic Tests of Climate Model Simulations for the Past 18,000 Years in Eastern North America." 3 years - \$170,000 (Co-PI with S. Jackson).
- 1991 to 1993 — National Science Foundation Grant OCE91-15923: "Interannual- to Millennial-scale Environmental Variability as Recorded in the Laminated Sediments of the Cariaco Basin, Venezuela: Late Quaternary to Present." 2 years - \$200,000 (PI with L. Peterson).

- 1990 to 1992 — National Science Foundation Grant DPP90-00371: "High-resolution Holocene Climatic Reconstructions from the Eastern Canadian Arctic." 3 years - \$216,000 (PI).
- 1989 to 1991 — NOAA: "Project ARRCC - Analysis of Rapid and Recent Climatic Change." 2 years - \$121,217 (PI with David Rind).
- 1990 to 1992 — National Science Foundation Grant OCE89-11484: "High-resolution Paleoenvironmental Study of the Cariaco Basin, Venezuela: Late Quaternary to Present." 2 years - \$477,000 (PI with L. Peterson and D. Murray).
- 1989 — C.N.R.S. Laboratory Travel Award for study in France- 10,000 FF (Recipient).
- 1989 to 1991 — EPA Grant: "Modeling Future Climate and Vegetation Change." Awarded through NASA/GISS, 3 years - \$200,000 (PI).
- 1988 to 1990 — National Science Foundation Grant ATM88-15506: "Century to Millennium-scale Variability of the Indian Monsoon over the Past 40,000 years." 2 years - \$170,000 (PI).
- 1988 to 1989 — National Science Foundation Grant DPP88-00749: "High-resolution Paleoclimatic Time Series from Annually Laminated Lake Sediments: Baffin Island and Northern Labrador." 1 year - \$64,617 (PI with G. Jacoby).
- 1987 to 1988 — EPA Grant: "Assessing the Response of Vegetation to Future Trace-Gas-Induced Climate Change: The Application of Ecological Response Surfaces." Awarded through NASA/GISS, 1 year - \$50,000 (PI with P. Bartlein).
- 1987 — Subcontracts, EPA Contract to Columbia University and NASA Goddard Institute for Space Studies (J. Hansen, R. Levenson, and C. Chu, principal investigators): "Global Climate Model Development and Sensitivity Experiments." 1 year - \$20,000 and \$10,000.
- 1986 to 1988 — National Science Foundation Grant ATM86-12376: "Precisely Dated Time Series and the Synoptic Climatology of the Past 12,500 years in Eastern North America." 2 years - \$148,580 (PI with G. Jacoby).

POST-DOCTORAL SUPERVISION

- 2002 to 2003 — Dr. Nan Schmidt
- 1997 to 1998 — Dr. Connie Woodhouse
- 1996 to 1997 — Dr. Elsa Cortijo
- 1995 to 1996 — Dr. Terri King

GRADUATE STUDENT SUPERVISION

Sarah Trube (PhD)	2008 to present	Univ. of Arizona — GEO (Co-Advisor)
Sarah White (MS)	2008 to present	Univ. of Arizona — GEO (Advisor)
Diane Thompson (PhD)	2008 to present	Univ. of Arizona — GEO (Comm. Mem.)
Nicholas McKay (PhD)	2007 to present	Univ. of Arizona — GEO (Advisor)
Cody Routson (PhD)	2007 to present	Univ. of Arizona — GEO (Advisor)
Jessica Conroy (PhD)	2003 to present	Univ. of Arizona — GEO (Advisor)
Toby Ault (PhD)	2005 to present	Univ. of Arizona — GEO (Comm. Mem.)
Adam Csank	2007 to present	Univ. of Arizona — GEO (Comm. Mem.)
Jennifer Rice (PhD)	2006 to present	Univ. of Arizona — GRD (Comm. Mem.)
Rachael Novak (MS)	2005 to present	Univ. of Arizona — GEO (Advisor)
Sephania McAfee (PhD)	2005 to present	Univ. of Arizona — GEO (Co-Advisor)
Anna Felton (MS)	2005 to 2006	Univ. of Arizona — GEO (Comm. Mem.)
Toby Ault (MS)	2005 to 2006	Univ. of Arizona — GEO (Comm. Mem.)
Kevin Anchukaitis (PhD)	2004 to 2007	Univ. of Arizona — GEO (Comm. Mem.)
Scott St. George (PhD)	2004 to present	Univ. of Arizona — GEO (Comm. Mem.)
Jessica Conroy (MS)	2003 to 2006	Univ. of Arizona — GEO (Advisor)
Allison Drake (MS)	2003 to 2005	Univ. of Arizona — GEO (Advisor)
Thomas Damassa (MS)	2002 to 2005	Univ. of Arizona — GEO (Comm. Mem.)

David Brown (PhD)	2002 to 2004	Univ. of Arizona – GRD (Comm. Mem.)
John Burkhart (PhD)	2002 to 2005	Univ. of Arizona – HWR (Comm. Mem.)
Cristina Luiz (MS)	2001 to 2004	Univ. of Arizona – GEO (Comm. Mem.)
Jim Morrison (PhD)	2003 to 2004	Univ. of Arizona – GEO (Advisor)
Camille Holmgren (PhD)	2001 to 2005	Univ. of Arizona – GEO (Comm. Mem.)
Jennifer Miller (PhD)	2001 to 2006	Univ. of Arizona – GEO (Comm. Mem.)
Katherine Likos (MS)	2000 to 2002	Univ. of Arizona – GEO (Advisor)
Tim Shanahan (PhD)	2000 to 2001	Univ. of Arizona – HWR (Comm. Mem.)
	2002 to 2006	Univ. of Arizona – GEO (Advisor)
Simone Alin (PhD)	2000 to 2002	Univ. of Arizona – GEO (Comm. Mem.)
Carrie Morrill (PhD)	1998 to 1999	Univ. of Arizona – GEO (Co-Advisor)
Carrie Morrill (PhD)	1998 to 1999	Univ. of Colorado (Co-Advisor)
Noah Daniels (MS)	1998 to 1999	Univ. of Colorado (Co-Advisor)
Mary Davis (PhD)	1998 to 2002	Ohio State Univ. (Committee Member)
Alex Robertson (MS)	1996 to 2000	University of Colorado (Advisor)
Jorunn Hardardottir (PhD)	1996 to 1999	Univ. of Colorado (Committee Member)
Frank Urban (MS)	1996 to 1999	Univ. of Colorado (Co-Advisor)
Ulrike Huber (PhD)	1996 to 1999	Univ. of Colorado (Committee Member)
Nathalie Smith (MS)	1996 to 1997	Univ. of Colorado (Committee Member)
Jennifer Mengan (PhD)	1996 to 2001	Univ. of Colorado (Co-Advisor, Comm. Mem.)
Mike Kerwin (PhD)	1995 to 2000	University of Colorado (Advisor)
David Gorodetsky (MS)	1995 to 1996	Univ. of Colorado (Committee Member)
Lisa Doner (PhD)	1994 to 2000	Univ. of Colorado (Committee Member)
Konrad Huguen (PhD)	1992 to 1997	University of Colorado (Advisor)
Jay Moore (MS)	1995 to 1996	Univ. of Colorado (Committee Member)
Peter Sauer (PhD)	1993 to 1997	Univ. of Colorado (Committee Member)
Regina Figge (PhD)	1992 to 1996	Univ. of Colorado (Committee Member)
Lisa Barlow (PhD)	1992 to 1994	Univ. of Colorado (Committee Member)
Lysanna Anderson (PhD)	1991 to 1997	Univ. of Colorado (Committee Member)
Colin Price (PhD)	1990 to 1992	Columbia Univ. (Committee Member)

COURSES TAUGHT

2010	<i>Climate Change Misunderstandings and Communication Seminar</i> , The University of Arizona
2009	<i>Climate Change and Water Law</i> , a workshop program sponsored by the National Judicial College (Reno, NV) and <i>Dividing the Waters</i> (co-organizer, students included several dozen federal and state judges from around the U.S.)
2009	<i>Western North American Drought Seminar</i> , The University of Arizona
2005-present	<i>Fundamentals of Past Climate Dynamics</i> – New graduate-level, The University of Arizona
2003	<i>Paleoclimate Seminar</i> , The University of Arizona
2002-present	<i>Paleoclimate Seminar</i> , The University of Arizona
2001-2003	<i>Life on Earth (included honors section)</i> , the University of Arizona
2001	<i>Paleoclimate Dynamics (North Atlantic Variability)</i> , the University of Arizona
2000	<i>Life on Earth (new course for non-science freshmen and sophomores)</i> , the Univ. of Arizona
2000	<i>Paleoclimate Dynamics (African and Asian Monsoons)</i> , the University of Arizona
1996	<i>Introduction to Climate System Modeling</i> at The University of Colorado, Boulder - Independent Study for three students. Co-taught with R. Webb
1994	<i>Methods of Quantitative Paleoenvironmental Reconstruction and Time series Analysis</i> at the Univ. of Colorado, Boulder - graduate seminar. Co-taught with R. Webb and D. Anderson

- 1985 *Stratigraphy and Sedimentation* at Brown University. Included leading spring a 10-day trip to study carbonate environments in South Florida

SUPERVISON/MANAGEMENT TRAINING EXPERIENCE

- 2002 - Completed "Human Subjects" Training/Certification
 1997 - NOAA Workshop for People with Disabilities
 1996 - US Gov't Senior Executive Service Approved Course:
 "The Aspen Institute Executive Seminar for the Public Sector"
 1995 - Department of Commerce Approved Management Course:
 "Merit System Principles: Understanding and Applying Them"
 1995 - Department of Commerce Approved Diversity Management Course: "Conflict Resolution"
 1994 - Department of Commerce Approved Management Course:
 "Improving Your Listening and Communication Skills"
 1992 - Department of Commerce Approved Management Course: "Equal
 Employment Opportunity Training for Supervisors and Managers."
 1992 - Department of Commerce Approved Management Course: "People Skills for Supervisors and
 Managers"

SERVICE ON UNIVERSITY COMMITTEES

- 2009 to present – Coordinator (with D. Liverman) of Provost's Environmental Faculty Hiring Initiative
 2008 to present – Member, Vice President for Research Advisory Council for Strategic Advancement
 2008 – Member, Provost's Advisory Council for Strategic Advancement (committee formed to provide
 one report on research priorities for UA)
 2008 to present – Member, UA Sustainability Committee
 2007 to present – The University of Arizona president's point person for the American College and
 University Presidents Climate Commitment
 2007 to present – Member, Biosphere 2 Advisory Board.
 2006 to present – Director, UA Translational Environmental Research Program (TRIF funded)
 2005 to 2006 Academic Year: on sabbatical, San Juan Mountains, Colorado
 2005 to present - University of Arizona advisory committee for the UA NSF AMS Facility
 2004 – University of Arizona representative to the Arizona governor's tri-university water sustainability
 planning group
 2003 to 2005 – Member, Provost Focused Excellence Study Team for "Earth Science and Environmental
 Programs"
 2003 to 2005 – Member, Executive Committee, University of Arizona -USGS Earth Surface Processes
 Research Institute (ESPRI)
 2003 UA-USGS ESPRI Council of Advisors
 2002 to 2003 – Co-Chair, UA Flandrau Science Center's Science and Technology Working Group (to
 provide science and technology input in the planning and development of a new 100,000 sq. ft.
 science center for the University of Arizona)
 2002 - Member, Biosphere2 Center Research Advisory Board, Columbia University
 2002 - Member, External Review Committee, University of New Mexico, Center for Advanced Studies
 2001 to present - University of Arizona Representative to US Council of Environmental Deans and
 Directors
 2001 - Chair, UA Institute for the Study of Planet Earth Program Review Self-Study Committee
 2001 to 2002 – Member, UA Dean Search Comm., College of Social and Behavioral Sciences
 2000 - UA Udall Fellowship Selection Committee
 2000-2002 - Member of University of New Mexico Center for Advance Studies External Advisory Panel
 2000 to 2001 - University of Arizona Campaign Water Committee
 2000 - Member, Lab. for Tree Ring Res. Faculty Search Comm, Univ. Arizona

2000 to 2001 - Member and Co-Chair, Dept. of Atmos. Sci. Faculty Search Committee, Univ. Arizona
 2000 to 2001 - College of Science rep. for Prop. 301 Water Initiative, Univ. Arizona
 2000 - Promotion and Tenure Committee, Dept. Geosci., Univ. Arizona
 2000 to present - Member, Global Change PhD Minor Faculty
 1999 to 2000 - Self-Study Future Directions Committee, Dept. Geosci., Univ. Arizona
 1996 to 1997 - Strategic Plan Committee, INSTAAR, University of Colorado
 1995 to 1996 - Research & Uniqueness & Funding Committee, INSTAAR, University of Colorado
 1993 to 1995 - Executive Committee, INSTAAR, University of Colorado
 1992 to 1997 - Future Funding Committee, INSTAAR, University of Colorado
 1992 to 1998 - Computer Committee, INSTAAR, University of Colorado

SERVICE ON LOCAL, NATIONAL and INTERNATIONAL SCIENCE and EDUCATION COMMITTEES

2010 to present - Lead Author, Working Group 2, Chapter 4 (Terrestrial and Inland Water Systems) UN/WMO Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment.
 2009 to 2011 - member, City of Tucson Climate Change Committee (appointed by Mayor and City Council)
 2008 to 2009 - member, U.S. National Academy of Science, Committee on Ecological Impacts of Climate Change
 2008 to 2009 - member, Federal Advisory Committee focused on "Climate change and the United States: Analysis of the effects and projections for the future - Unified Synthesis Product"
 2008 to present - Member, University Corporation for Atmospheric Research Membership Committee
 2007 - Member, U.S. National Science Foundation advisory panel for the FY 2007 Human and Social Dynamics competition. Washington, DC.
 2006 to 2007 - Member, Committee charged with drafting society's new Statement on Climate Change Impact, American Meteorological Society
 2004 to 2006 - Member, American Geophysical Union Global Environmental Change Executive Committee
 2002 to 2005 - Member, Board on Higher Education, American Meteorological Society
 2004 to 2007 - Convening Lead Author, Working Group 1, Chapter 6 (Paleoclimatology) UN/WMO Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment. Also, Lead Author for the Technical Summary, and also Lead Author for the Summary for Policy Makers.
 2004 to 2005 - Member, Subcommittee for Global Change Research of the Department of Energy's Biological and Environment Research Committee (BERAC)
 2003 to 2005 - Member, NOAA Ad Hoc Group on Paleoclimatology
 2003 to 2009 - Member, NOAA Climate Working Group - formally the NOAA Climate and Global Change Working Group (also on Executive Committee of the latter)
 2002 to 2007 - Chair/Member, NSF Arctic System Science (ARCSS) Committee (Chair to 2006)
 2001 to 2003 - member, U.S. National Academy of Science, Committee on Coping with Increasing Demands on Government Data Centers
 2000 to 2003 - member, U.S. National Academy of Science, Committee on Abrupt Climate Change: Science and Policy
 1999 to 2004 - Co-chair (with M. Cane), US PAGES/CLIVAR Working Group
 1999 to 2002 - member, NSF Study of Environmental Arctic Change (SEARCH) Steering Committee
 1998 to 2008 - member, NSF Arctic System Science (ARCSS) Committee
 1997 to 2003 - member, U.S. National Research Council National Committee for International Quaternary Association (INQUA)
 1997 to 1999 - member, Ocean Drilling Program (ODP) Science Committee (SCICOM)
 1995 to 2002 - Co-Chair (with J-C Duplessy), IGBP PAGES-WCRP CLIVAR Working Group
 1994 to 1998 - member, Arctic System Science Data Management Working Group
 1994 to 1999 - member, Steering Committee, US/NSF Earth System History Research Initiative

1993 to 1999 - member of IGBP PAGES (Past Global Changes) Scientific Steering (SSC) and Executive Committees, Vice Chairman SSC 1998-99.
 1993 to 1999 - member, IGBP DIS (Data and Information System) Scientific Standing Committee
 1991 to 1998 - member, Steering Committee, "Paleoclimate of Arctic Lakes and Estuaries (PALE)," NSF Sponsored research initiative with broad international participation.

NATIONAL AND INTERNATIONAL WORKSHOPS CONVENED

August, 2009 – “SynTrace-21 Workshop,” National Center for Atmospheric Research, Boulder, CO (member, organizing committee)
 January, 2009 – First Arizona Adaptation Stakeholder Work Group Meeting, Tucson, AZ (member, organizing committee)
 January, 2009 – “Adaptation to Climate Change in the Desert Southwest: Impacts and Opportunities,” Tucson, AZ (member, organizing committee)
 June, 2008 – PAGES/CLIVAR workshop “Reducing and representing uncertainties in high-resolution proxy climate data,” Treste, Italy (member, organizing committee)
 May, 2008 – NOAA RISA National Climate Service Visioning Workshop, Denver, CO (member, organizing committee)
 October, 2006 – Climate Variability & Change in the San Juan Mountains: A Scientist-Stakeholder Dialogue, Durango CO (member, organizing committee)
 July, 2006 – Retreat of the NOAA Climate Working Group focused on improving NOAA’s ability to provide the nation with drought information, Santa Fe, NM (member, organizing committee).
 May, 2006 – Workshop focused on methodologies for improved analysis of laminated lake and marine sediments, Tucson, AZ (Organizer and host)
 May, 2006 – Workshop focused on Arctic climate variability and change over the last 2000 years (co-organizer and host). Tucson, AZ
 May, 2005 – Second Sustainability Under Uncertainties in Arid and Semiarid Ecosystems workshop, Tucson, AZ (member, organizing committee).
 January, 2005 – First Sustainability Under Uncertainties in Arid and Semiarid Ecosystems workshop, Tucson, AZ (member, organizing committee).
 August, 2004 – Second NSF Retreat on Arctic System Science Synthesis, Lake Tahoe (lead convener with others on NSF Arctic System Science Committee).
 June, 2004, 1st International CLIVAR Science Conference, Baltimore, Maryland (member, organizing committee).
 February, 2004, NOAA Workshop “Enhancing Decision-making Through Integrated Climate Research: Alaska.” Anchorage, Alaska (member, organizing committee).
 November, 2003 - CLIVAR/PAGES/IPCC Workshop: A multi-millennia perspective on drought and implications for the future, Tucson, AZ (co-convened with K. Trenberth).
 August, 2003 – NSF Retreat on Arctic System Science Synthesis, Big Sky, MT (lead convener with others on NSF Arctic System Science Committee).
 March, 2003 – International Limnogeology Congress, Tucson AZ (organizing committee).
 May, 2002 – NRC Workshop on coping with Increasing Demands on Government Data Centers, Austin, TX (co-convened with several others on NRC Committee).
 September, 2001 – International Continental Drilling Programme Workshop on Scientific Drilling at the Lake Bosumtwi Impact Structure, Potsdam, Germany (co-convened with C. Koeberl, B. Milkereit, and C. Scholz).
 June, 2001 – NOAA funded workshop: International Workshop on Applications and Human Dimensions of Monsoon Research, Tucson, AZ (co-convened with B. Morehouse, A. Ray, and R. Webb).
 March, 2001 – NOAA and USDA funded Fire and Climate in the Southwest 2001, Tucson, AZ (co-convened with four others).
 February, 2001 – NOAA and USDA funded Fire and Climate 2001, Tucson, AZ (co-convened with four others).

- October, 2000 – IGBP PAGES Workshop: High-Resolution Climate Variability of the Holocene, Avignon, France (co-convended with K. Briffa, D. Raynaud, J.-C. Duplessy and R. Bradley).
- September, 2000 – NRC Abrupt Climate Change: Science and Policy Workshop, Palisades, NY (co-organized with R. Alley et al.).
- November, 1999 – Joint WCRP-IGBP PAGES-CLIVAR Workshop on “Climate Variations of the Last 300 to 1000 Years”, Venice, Italy (co-convended with J.-C. Duplessy).
- June, 1999 - NOAA/NASA Workshop: Assessing the full range of central North America Droughts and Associated Landcover Change, Boulder, Colorado (co-convended with R. Webb and C. Woodhouse)
- January, 1999 - Joint WCRP-IGBP PAGES-CLIVAR Data Management Workshop, Boulder, CO (co-convended with R. Webb and D. Anderson).
- April, 1998 – IGBP PAGES (Past Global Changes) First Open Science Meeting, London, England (Co-organized with 5 other).
- April, 1997 – Joint IGBP-World Data Center sponsored workshop on meeting the scientific data management needs of the IGBP, Boulder (co-organized with G. Szejjwach)
- September, 1996 – Joint CLIVAR (World Climate Research Program)-PAGES (International Geosphere Biosphere Program) sponsored “PAGES-CLIVAR Working Group” workshop on climate variability and predictability, Villefrance, France (co-convended with J.-C. Duplessy)
- March, 1996 – NSF sponsored Earth System History Workshop “Geologic records of terrestrial processes and systems,” Portland OR (co-organized with P. Olsen, N. Pisias and T. Webb III).
- November, 1994 – Joint CLIVAR (World Climate Research Program)-PAGES (International Geosphere Biosphere Program) sponsored workshop on climate variability and predictability, Venice Italy (co-convended with J.-C. Duplessy)
- August, 1993 – IGBP PAGES Sponsored "Global Paleoenvironmental Data," Bern Switzerland (co-convended with J. Pilcher).
- January 1988 – NSF sponsored meeting of the Coordination Group for "The global reconstruction and modeling of interannual, decadal, and century-scale climate variability," New York (co-convended with G. Jacoby).

SYMPOSIA and SPECIAL SESSIONS CONVENED

- December, 2003 – “The Last Interglacial” 2003 Fall Meeting of the American Geophysical Union, San Francisco (co-convended with G. Miller and B. Otto-Bleisner).
- December, 1997 – “Tropical Ocean and Climate Records From the Anoxic Cariaco Basin” 1997 Fall Meeting of the American Geophysical Union, San Francisco (co-organized with L. Peterson and F. Muller-Karger)
- December, 1995 – “Abrupt Climatic Change During the Current Interglacial” 1995 Fall Meeting of the American Geophysical Union, San Francisco (co-organized with L. Keigwin)
- October, 1992 – “WDC/IGBP Paleoclimate Data” 13th International CODATA Conference, Beijing, China.
- May, 1992 – “Decadal to millennial-scale climatic variability” 1992 Spring Meeting of the American Geophysical Union, Montreal (co-chaired with D. Murray).
- February, 1992 – “High-resolution studies of past climate” 1992 American Society of Limnology and Oceanography Aquatic Sciences Meeting, Sante Fe, New Mexico (co-chaired with W. Curry).
- August 1989 – “The past as a key to understanding future global change,” 74th Annual Meeting of the Ecological Society of America, Toronto, Canada (co-convended with G. King).

FIELD EXPERIENCE

- 2009 – Leader, Lake coring expedition to Peruvian Amazon
- 2007- Co-leader, Lake coring expedition to Tibet
- 2004 – Co-leader, Lake coring in the Galapagos
- 2000 - Co –leader, Lake coring expedition to Ghana

1999 - Co -leader, Lake coring expedition to Ghana
 1999 - Leader, Lake and tree coring expedition to Northern Labrador
 1998 - Co-leader, Lake coring expedition to Southern Greenland
 1997 - Co-leader, Lake coring expedition to Southern Greenland
 1997 - Climbed Cerra Aconcagua, 6962m (with D. Anderson)
 1996 - Co-leader, Lake coring Baffin Island, Canada and West Greenland.
 1996 - Co-leader, Lake coring expedition to Ghana.
 1995 - Co-leader, Lake coring expedition to Tibet.
 1995 - Co-leader, Lake coring expedition to Nepal.
 1994 - Co-leader, Lake coring expedition to Tibet.
 1993 - Leader, Lake coring expedition to Nepal.
 1993 - Leader, Arctic lake coring expedition, Baffin Island, Canada.
 1991 - Leader, Arctic lake coring expedition, Baffin Island, Canada.
 1990 - Co-chief Scientist, R/V Washington, Cruise PLUME 7, Cariaco Basin, Venezuela.
 1989 - Leader, Arctic lake coring expedition, Baffin Island, Canada.
 1989 - Leader, Arctic lake and tree coring expedition, northern Labrador, Canada.
 1986 - Scientist, R/V Conrad, Cruise RC27-04, Arabian Sea.
 Four winters - Leader, lake coring trips to Upper Midwest US and Canada.

SELECTED PRESS INTERACTION

January, 2010 – Featured in four-page News Feature story in *Nature* on “The Real Holes in Climate Science” by Quirin Schiermeier
 September, 2009 – Featured in *NPR All Things Considered* story on “Tipping Points” in environmental and other systems.
 September, 2009 – Featured in many media stories (e.g., AP story, *Tucson Daily Star*, BBC story, NY Times) related to Arctic climate change and our new report in *Science*. Included NSF Press Release and being featured on the NSF home page.
 June, 2009 – Featured in regional media in stories on new federal climate report on “Global Climate Change Impacts in the United States”
 May, 2009 – Featured in widely syndicated AP story on sea level change and survival of the Maldives
 April, 2009 – Received major international press coverage related to new African drought report in *Science*, including AP, NY Times and front pages of *Arizona Daily Star* and *The Arizona Republic*. Included NSF Press Conference and being featured on the NSF home page.
 January, 2009 – Appeared on *Arizona Illustrated* evening TV show.
 October, 2008 – Featured and quoted in stories in the *Arizona Daily Star* (front page) and *Tucson Citizen* regarding the new Institute for Environment and Society at the University of Arizona
 May 1, 2008 - Quoted in story on decadal climate prediction and the next 10 years of climate change, *Christian Science Monitor*
 April, 2008 – Featured in three-day Earth Day series on drought and climate change in the Southwest, *Arizona Daily Star*, Tucson, Arizona.
 April, 2008 – Featured on Earth Day, *KOLD TV NEWS 13*, Tucson, Arizona.
 March 28, 2008 – Part of an hour-long NPR program *On Point*, focused on the Medieval Warm Period and implications for the future, particularly in the U.S. West.
 March 24-28, 2008 – Featured in week-long TV series “Winds of Change” on climate change, KPNX-TV 12 News, Phoenix, AZ
 March, 2008 – *Nature Geoscience* paper stories (Neff et al., 2008) reported on by NPR (story on *All Things Considered*) and *New York Times*.
 February 1, 2008 – Quoted in a front-page story in the *Washington Post* on climate change and the west being attributed to human causes.
 December 29, 2007 – Featured in story about California climate change in an AP story
 December 28, 2007 – Featured in climate change and La Niña story in the *Arizona Republic*

- November 18, 2007 – Featured in front-page story on climate change in the *San Francisco Chronicle*
- November, 2007 – Featured in *History Channel* documentary “‘A Global Warning’.
- October 22, 2007 – Featured along with Vice President Gore in NPR program “U.N. Panel Shares Nobel with Gore”. Also, featured in multiple newspaper stories around Arizona for sharing Nobel Peace Prize for role as a Coordinating Lead Author in the IPCC Fourth Assessment.
- September, 2007 – Featured in widely published *Associated Press* stories on rising sea level.
- September, 2007 – Featured in story on university campus sustainability in the *Arizona Daily Star*.
- September, 2007 – Featured in story on Arizona climate change and the Western Climate Initiative in the *Havasupai News-Herald* (Arizona)
- August, 2007 – as of this month, we’ve had over 100 requests from journalists, media, educators and other outreach entities for future sea level data, images and information. This does not count general use of our lab web resource.
- August 24-29, 2007 – Interviewed for KUAT-FM Arizona Spotlight on subject of water sustainability; also was the guest for a 1-hour live talk-radio segment on KVOI-AM, and a shorter interview on KJLL-AM, both focused on the same topic.
- July, 15, 2007 – Graduate student Rachael Novak featured in NPR All Things Considered radio show “CLIMATE CONNECTIONS: Drought Threatens Navajo's Crops, Culture”.
- July, 2007 – Featured in a half-hour documentary by Blur to Focus Productions and The NM State Engineer, entitled: “*Climate Change: What does it mean for New Mexico?*”
- July, 2007 – Featured in two stories in the *Wilmington Star* (NC) on future climate and sea level change.
- July 9, 2007 – Featured in NPR *Morning Edition* show “CLIMATE CONNECTIONS: A Family Vacations Amidst Changing Landscape “ as well as in an NPR *All Things Considered* show “CLIMATE CONNECTIONS: Ancient Culture Prompts Worry for Arid Southwest.”
- June, 2007 – Filmed at Mesa Verde for History Channel documentary on climate change.
- May, 2007 – Featured in article in *Nature* on start-up company Climate Appraisal Services.
- March, 2007 – Featured in story in *USA Today* (and follow-on stories elsewhere) on start-up company Climate Appraisal Services.
- February, 2007 – Widely featured in national and international press for role in UN Intergovernmental Panel on Climate Change
- November, 2006 – Featured in stories in the *Arizona Republic* and *Arizona Daily Star* regarding Supreme Court global warming case.
- November, 2006 – Featured in *Associated Press* story on climate change, Arctic wildfire and greenhouse gas feedback.
- October 30, 2006 – Featured in story in the *Albuquerque Journal* on future drought and reduced river flow in the Southwest.
- October, 2006 – Featured in stories in the *Denver Post*, *Farmington Daily Times* and *Grand Junction Sentinel* on climate change and the impacts of this change in the U.S. West and San Mountains of Colorado. Also was focus of 30minute radio interview on the same topic (KDUR, Durango).
- August 24, 2006 – Featured in NPR on *All Things Considered* interview about the freshening of the Arctic and potential impacts on the North Atlantic.
- August 11 & 15, 2006 – Featured in stories in the *Wall Street Journal* and *USA Today* about accelerating mass loss of the Greenland Ice Sheet
- May, 2006 – Featured in major climate change series in *USA Today*
- May, 2006 – Taped two 30 minute shows (one on global warming, and one on drought) for *Earthtalk Today* with Alexandra Paul and Peter Kreidler (in Los Angeles, CA).
- March and April, 2006 – Extensive global media coverage of two *Science* papers (with cover). Included front page coverage in papers in the US and Canada, NPR interview, and talk radio. Also reported on in *Time Magazine*, *Scientific American.com*
- January 30, 2006 – Featured in *Geotimes* online story on record 2005 global temperatures
- December, 2005 – Feature guest on Earth Changes TV radio show (ca. 45 minutes of talk radio)

August, 2005 – extensive press coverage of *EOS* paper, at least 130 print media articles in first week. Press interest still alive at end of year. Included request from U.S. Congress for article.

May 26, 2005 – Guest on KUAT TV *Arizona Illustrated* TV show

February 16, 2005 – Featured in front-page article on climate change and forest health in the *Arizona Daily Star*.

February 14, 2005 – Featured in front-page article on the climate change debate in the *Wall Street Journal*.

February 6, 2005 – Featured in article on drought and climate change in the *Washington Post*.

February 5, 2005 – Guest on talk radio show “Weather Talk with Paul Huttner”

January 24, 2005 – Featured in cover story on past climate change in the West. *High Country News*.

January 30, 2005 – Featured in article on global warming in the *Arizona Daily Star*.

January 10, 2005 – Featured in article on Arctic climate change – United Press International (including the *Washington Times*)

January 5, 2005 – Guest on KUAT TV *Arizona Illustrated* TV show.

December, 2004 – Co-author full page Op-Ed “Perspective” on climate change in December 13, 2004 *Tucson Citizen*.

July, 2004 – Featured in Weather Channel special on climate change: “Forecast Earth: A Planet in Change”

June, 2004 – Participant in CLIVAR (World Climate Research Programme Climate Variability and Predictability Programme) Open Science Conference Press Conference, Baltimore MD

May 25, 2004 – Participant in press conference and pre-screening of 20th Century Fox Feature Movie: “Day after Tomorrow,” Tucson, AZ.

April 22, 2004 (Earth Day Week) – Sea level research and web site (UA Dept of Geoscience Environmental Studies Lab) featured on National Geographic Web site main page.

April, 14, 2004 -- Live interview on KTAR Radio, Phoenix morning show – drought issues

April, 2004 -- Interviewed for NPR Feature on abrupt climate change

April, 2004 -- Interviewed for article(s) on arctic environmental change for *New Yorker* magazine.

April, 2004 -- Interviewed for Evening News, Channel 4 TV, Tucson

October 29, 2003 -- Featured in articles on arctic climate that appeared in the *Seattle Post-Intelligencer* and elsewhere.

June 15, 2003 -- Featured in story on water crisis in the *Houston Chronicle*

June 22, 2003 – Featured in story “Climate Boom & Bust: High Population Suffers More in Dry Times” in the *Albuquerque Journal*.

May 21, 2004 – Interviewed about drought on KUAT-TV show *Arizona Illustrated*.

May 9, 2003 -- Featured in story on drought in the *Arizona Daily Star*

April, 2003 – Multi-day film shoot in Tucson region for documentary “The Venus Theory – a documentary film on climate change” (52 minutes) Talent House, Helsinki 2004.

December 16, 2002 -- Guest for 20 minutes on KPRA (Berkeley CA) radio morning show

December 8 2002 -- Featured in climate change stories in Los Angeles Times and Seattle Times

May 9, 2001 -- Authored invited 2-page “Insight and Opinion” article titled “Global warming is all too real,” *Albuquerque Tribune*

April 19, 2001 -- Featured in story on NSF-sponsored Holocene climate change workshop, Richmond Times-Dispatch

April 12, 2001 -- Featured in story on global warming and mathematics in Tucson Citizen

March 15 2001 -- Guest on one-hour AM990 (KTKT-Tucson) Reed Schmidlin talk radio show

March 8, 2001 -- Featured in lead story on Tucson Channel 13 (CBS) report on global warming and how it could impact the US and US Southwest

January, 19 2001 -- Featured in climate change story – Honolulu Star-Bulletin “Climate prediction could ease global warming’s impact, geologist says”

Spring, 2000 -- Featured in Los Angeles Times front page story on climate change, 2000

April, 2000 -- Featured in NOVA/Frontline 2-hour documentary “What’s up with the weather?”

February, 2000 -- Guest Opinion titled "Global Warming Is Not Pseudo-Science" published in Sunday Feb. 13 issue of Arizona Daily Star (co-authored with Julie Cole).

December, 1999 -- Science results featured on www by University Science (unisci.com/) and Yahoo! News

December, 1999 -- Interview with University of Arizona News Services aired on state-wide radio program

December, 1999 -- Interviewed for article on paleoclimatology in the Christian Science Monitor – 1 page article appeared Jan 18, 2000

August, 1999 -- Interviewed by South Africa Broadcast Company television story on climate change and first World Data Center in Africa.

July, 1999 -- Interviewed on National Public Radio Story on Siberian Environmental Change

July, 1999 -- Interviewed by US News & World Report for background on climate story

June, 1999 -- Interviewed for South African radio show – climate change

May, 1999 -- Interviewed for NOVA/FRONTLINE documentary on global warming

May, 1999 -- Interviewed for global warming article in "Rolling Stone"

April, 1999 -- Interviewed for global warming story in "Popular Science"

March, 1999 -- BBC film team accompanied Overpeck research team on Arctic field expedition for three days of filming/interviewing for documentary on Atlantic climate change. Results featured in 60 minute documentary "The Bill Chill"

December, 1998 -- Lead scientist in NOAA Press Conference on drought variability (at National Press Club, Washington). Reported live on national network television and radio programs, plus reports appeared around nation in print media

July, 1998 -- Interviewed on National Public Radio's "All things considered" – helping to put the summer 1998 heat wave in perspective

February, 1998 -- Arctic Warming Press Kit requested by, and provided to Executive Office of the President, Council on Environmental Quality

January, 1998 -- Interview on Arctic environmental change distributed by Arctic Science Journeys radio news service

December, 1997 -- Interviewed for story in Earth Magazine that was published early in next year

November, 1997 -- Lead scientist in joint NOAA-NSF Press Conference on Arctic Climate Change, Washington, DC. Reported on in newspapers across US and Canada (often on front page), as well as on TV (CNN) and National Public Radio. Also covered in Europe.

November, 1997 -- Interviewed for background on 4-day series on Global Warming that appeared in the Washington Post during the week of Nov. 10.

August, 1997 -- Quoted in Washington Post "Horizon" feature on Little Ice Age. Included photos taken during 1997 Greenland field season

March, 1997 -- Research mentioned in "Computer Life"

January, 1997 -- Featured in "Science News"

December, 1996 -- Featured in "Washington Times"

December, 1996 -- Featured as lead article in Discovery Section of "Boulder Daily Camera"

November, 1996 -- Focus of 8-page interview in "Environmental Review"

September, 1996 -- Participated in "State of the Climate" briefing at the National Press Club, Washington. Broadcast on CSPAN and reported by over 150 newspapers nation-wide.

June, 1996 -- Appeared on "ABC Nightly News"

June, 1996 -- Featured in "Sea Technology"

May, 1996 -- Featured in "New York Times"

March, 1996 -- Featured in cover story in "Science News"

Pre-1996 -- Didn't keep track of press interaction, but was featured several times in print media, including "Wall Street Journal" and "Washington Post." Also appeared on National Public Radio.

SERVICE ON EDITORIAL BOARDS

Spring, 2007 – Founding Editor (with M. Miller and B. Morehouse) of the new “*Environmental Science, Law, and Policy*” book series, University of Arizona Press and partners (to present).
 May, 2006 – Appointed to Board of Reviewing Editors, *Science* (to present)
 January, 1993 -- Appointed to the Editorial Advisory Board of *Quaternary Science Reviews* (to 2008)
 January, 1993 -- Appointed to the Editorial Board of *Geology* (2-year term).

OTHER PROFESSIONAL ACTIVITIES

May, 2010 – Invited Speaker, Presentation and discussion with senior and middle-level leadership, Tucson Water. Talk title: “Ongoing natural and anthropogenic climate change challenges in the Colorado River Basin”, Tucson, AZ.
 April, 2010 – Keynote speaker, Annual conference of the American Society for Photogrammetry and Remote Sensing, San Diego, CA. Talk title: “Global Climate Change and the need for Remote Sensing for Detection and Adaptation”
 April, 2010 – Invited speaker at El Colegio Nacional, Mexico City, Mexico. Talk title: “Global Climate Change and the North American Southwest”
 April, 2010 – Invited mentor and speaker, NSF DISCCRS V Symposium for recent Ph.D. students studying climate change and climate change impacts, Mesa, AZ - Talk title: “Future Southwest Climate: A Betting Guide”.
 March, 2010 – Invited speaker at 2010 Collaborative Adaptive Management Network (CAMNet) Annual Rendezvous, Tucson, AZ. Talk title: “The Southwest Climate Challenge”
 February, 2010 – Invited speaker, Sandia National Laboratory, Albuquerque, NM. Talk Title: “Ongoing environmental change in the West, and what can we do to help?”
 December, 2009 – Invited speaker at annual meeting of the Colorado River Water Users Association, Las Vegas, NV
 December, 2009 – Invited briefing of Arizona Department of Environmental Quality Director and senior staff on climate change in Arizona and the Southwest.
 November, 2009 – Presented invited Southwest climate briefing to the US National Academy Board on Earth Sciences and Resources, Oracle, AZ
 September, 2009 – Invited speaker/participant at annual WAIS: The West Antarctic Ice Sheet Initiative annual workshop, Seattle, WA
 August, 2009 – Invited speaker at the “Water Symposium” hosted by the Arizona Hydrological Society and the American Institute of Hydrology, Scottsdale, AZ
 August, 2009 – Invited speaker/participant “SynTraCE---21,000” (Transient climate simulations of the last 21,000 years) Workshop, Boulder, CO
 July, 2009 – Invited participant – IPCC Fifth Assessment Report Scoping Meeting, Venice, Italy
 July, 2009 – Invited keynote speaker IGBP PAGES Open Science Meeting, Corvallis, OR
 May, 2009 – Invited to present testimony at field hearing on “The Effects of Water Quality Issues in the Lower Colorado River”, Subcommittee on Water and Power, U.S. House of Representatives, Tucson, AZ.
 May, 2009 – Invited speaker, U.S. Congress House and Senate Briefings on Adaption to Climate Change, Focus on Water. Washington DC
 April, 2009 – Invited speaker, Tucson Committee on Climate Change Inaugural Meeting
 March, 2009 – Invited keynote speaker, 11th Pacific Science Inter-Congress, Tahiti, French Polynesia.
 February, 2009 – Invited speaker, American Association for the Advancement of Science Annual Meeting, Chicago, IL.
 February, 2009 – Invited lunch speaker, Translational Environmental Research Symposium, Tucson, AZ

- February, 2009 – Invited seminar speaker, Department of Atmospheric Sciences, Colorado State University
- January, 2009 – Invited speaker, “Adaptation to Climate Change in the Desert Southwest: Impacts and Opportunities” Conference, Tucson, AZ
- January, 2009 – Invited panelist in session on national climate services, American Meteorological Society Annual Meeting, Phoenix, AZ
- May, 2008 – Invited to present testimony at hearing on “Water Supply Challenges for the 21st Century”, Committee on Science and Technology, U.S. House of Representatives, Washington, DC.
- April, 2008 – Invited Speaker, Texas A&M University, College Station, TX
- April, 2008 – Invited Speaker, University of Washington public evening lecture
- April, 2008 – Invited Speaker, Rotary Club luncheon lecture, Seattle, WA
- April, 2008 – Invited Speaker, Pacific Science Center Evening Lecture, Seattle, WA
- March, 2008 – Invited speaker, “Solar Rock” event, Tucson, AZ
- March, 2008 – Invited dinner speaker, Spring meeting of the Montrose Memorial Hospital staff and friends.
- March, 2008 – Invited Speaker, Yale Club, Tucson, AZ
- March, 2008 – Invited Speaker, Arizona Science Center, Phoenix, AZ
- March, 2008 – Invited Speaker, Honors College Luncheon
- March, 2008 – Invited Speaker, BIO5 and other units, University of Arizona, Tucson, AZ
- February, 2008 – Invited Speaker, Institute of Arctic and Alpine Research, University of Colorado, Boulder, CO.
- January, 2008 – Invited Speaker, Frankel Foundation Board Retreat, Phoenix, AZ.
- November, 2007 – Invited Speaker and Panel Member, Climate Change and the Role of Higher Education in Arizona: *Preparing our Students for a Changing World*, Phoenix, AZ.
- October, 2007 – Invited Speaker, Water Policies and Planning in the West: Ensuring a Sustainable Future, Western Governors’ Association and the Western States Water Council, Salt Lake City, UT.
- October, 2007 – Invited Speaker, Department of Soil, Water and Environmental Sciences, University of Arizona, Tucson.
- October, 2007 – Invited Evening Speaker, Arizona Association for Environmental Educators conference, Tucson, Arizona.
- October, 2007 – Invited speaker, series of three lectures sponsored by the State Engineer of New Mexico, Albuquerque and Santa Fe, New Mexico.
- October, 2007 – Invited Speaker - New Mexico Climate Change Ecology and Adaptation Workshop, Albuquerque, New Mexico.
- October, 2007 – Invited Evening Speaker on Climate Change, Public Forum Co-sponsored by The Nature Conservancy and the University of Chicago, Chicago, Illinois.
- October, 2007 – Invited Workshop Participant, "Future Climate Change Research and Observations: GCOS, WCRP and IGBP Learning from the IPCC Fourth Assessment Report," Sydney, Australia
- September, 2007 – Taaffe Lecturer, Ohio State University, Columbus, Ohio.
- September, 2007 – Invited Speaker, Border Institute-IX: Security, Development and the Environment at the U.S.-Mexican Border.
- August, 2007 – Invited Speaker, 2007 Regional Water Symposium: “Sustainable Water, Unlimited Growth, and Quality of Life: Can We Have It All?”, Tucson, AZ
- July, 2007 – Invited Seminar Speaker, Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing, China
- May, 2007 – Invited Speaker, “Dividing the Waters: Science for Judges Workshop IV,” Boulder, Colorado
- March, 2007 – During a visit to the U.S. House of Representatives, gave an hour-long briefing "Global Warming and the Impacts in the American West" hosted by the House Committee on Science, and also met w/ staffers of two western Congressmen (Rep. Renzi and Rep. Matheson).

- March, 2007 – Invited Speaker – National Science Foundation Earth System History Meeting, Washington, DC.
- March, 2007 – Invited Speaker, OUT LOUD Program, Telluride, Colorado.
- March, 2007 – Invited Speaker, Arizona Board of Regents Meeting.
- March, 2007 – Invited Speaker, UK Royal Society Meeting on Climate Change.
- February, 2007 – Briefed Congresswoman Giffords on climate change, the IPCC, and what it means for Arizona.
- February, 2007 – Met with Congressman Bart Gordon, and participated a House Committee on Science and Technology Briefing on “Sea Level Rise - The State of the Science;” in the afternoon repeated the briefing for staff members of the U.S. Senate Committee on Environment and Public Works
- February, 2007 – Invited Speaker, UN/WMO IPCC Working Group I Plenary.
- December, 2006 – Invited Speaker, American Geophysical Union Fall Meeting
- December, 2006 – Invited Panelist, Interfaith Discussion of Climate Change, Tucson, AZ
- November, 2006 – Invited speaker, Earth System Science Partnership, Beijing, China.
- October, 2006 – Invited speaker, Governor of New Mexico’s Fourth Annual Drought Summit
- October, 2006 – Invited speaker, San Diego Natural History Museum
- October, 2006 – Invited speaker, University of Arizona College of Science Public lecture series “Global Climate Change,” Tucson
- October, 2006 – Invited speaker, Climate Variability & Change in the San Juan Mountains: A Scientist-Stakeholder Dialogue, Durango, CO
- October, 2006 – Invited evening speaker, Fort Lewis College, Durango, CO
- September, 2006 – Invited speaker, Arizona Academy Village, Tucson
- August, 2006 – Invited speaker – 36th American Quaternary Association Biennial Meeting, Bozeman, MT.
- July, 2006 – Invited participant, UN/WMO Intergovernmental Panel on Climate Change Fourth Lead Authors Meeting, Bergen, Norway.
- June, 2006 – Invited participant and speaker, IGBP PAGES/ WCRP CLIVAR Workshop on ‘Past Millennia Climate Variability’, Wengen, Switzerland.
- June, 2006 – Invited speaker (1 hour plenary) – 11th Annual Community Climate System Model Workshop, Breckenridge, CO.
- May, 2006 – Invited speaker – MountainFilm, Telluride, CO
- May, 2006 – Scientific co-author/member of *Amici Curiae* brief to the U.S. Supreme Court – focused on climate change
- April, 2006 – Dinner speaker, Climate and Energy Funders Group, Phoenix, AZ.
- February, 2006 – Invited speaker, Alaska Forum on the Environment, Anchorage, AK.
- January, 2006 – Invited speaker (1 hour plenary), 5th Annual conference of the Quivira Coalition - ‘Bridging the Urban-Rural Divide’, Albuquerque, NM.
- January 2006– Elected Vice President of the Board for the Mountain Studies Institute, Silverton, Colorado
- December, 2005 – Invited seminar speaker, Fort Lewis College
- December, 2005 – Invited participant and speaker, UN/WMO Intergovernmental Panel on Climate Change Third Lead Authors Meeting, Christchurch New Zealand
- November, 2005 – Invited speaker, Climate, Oceans and Policies – Challenges for the 21st Century Conference, Royal Norwegian Embassy and The Carnegie Institution, Washington, DC.
- October, 2005 – Invited speaker and participant, Climate Change and Conservation Workshop, The National Center for Ecological Analysis and Synthesis (NCEAS), Santa Barbara, CA.
- September, 2005 – Invited speaker and participant, National Research Council Board on Atmospheric Sciences and Climate Workshop on Multiple Environmental Stresses, Irvine, CA.
- September, 2005 – Invited dinner speaker and participant, Conference on Urban Water Supplies and Climate Change in the West, Las Vegas, NV.

- August 2005 – Elected Member of the Board for the Mountain Studies Institute, Silverton, Colorado
- July, 2005 – Gave public lecture on climate change (“Climate Change: What's Ahead for the West”) sponsored by the New Mexico State Environment Department, Santa Fe, NM
- July, 2005 – Invited lunch speaker, State of New Mexico Climate Change Advisory Group Meeting #1, Santa Fe, NM
- July, 2005 – Discussion speaker, Pinhead Institute Town Talk, Telluride, CO.
- June, 2005 – Participant/speaker, San Juan Mountains Research Retreat, Mountain Studies Institute, Silverton, CO
- May, 2005 – Invited speaker and participant, NASA-NOAA Workshop on “Observational and modeling requirements for predicting drought on seasonal to decadal time scales,” University of Maryland
- May, 2005 – Invited participant, UN/WMO Intergovernmental Panel on Climate Change Second Lead Authors Meeting, Beijing, China.
- April, 2005 – Invited Speaker, University of Arizona Dean of Students Faculty Lecture Series; talk title: “Drought: Lessons from the Future.”
- April, 2005 – Dinner Speaker at informal meeting of water managers for Albuquerque and the state of New Mexico
- March, 2005 – Invited speaker, Arizona Geological Society meeting, Tucson, AZ.
- February, 2005 – Invited speaker and participant, Workshop on “Climate Change & Ecosystem Impacts in Southwest Forests and Woodlands,” Sedona, AZ.
- February, 2005 – Guest lecturer, Environmental Law Seminar, University of Arizona.
- April, 2004 – Invited Speaker - “Perspectives on Abrupt Climate and Environmental Change,” Briefing for the NSF Geosciences Directorate.
- February, 2004 – Testified in support of Arizona State Senate Bill 1227 (State Climate Change Study Committee); Senate Natural Resources and Transportation Committee
- February, 2004 – Panel Member, Plenary Session on “Managing Fish and Wildlife in the face of Climatic Variability,” 37th Annual Joint meeting of the Arizona and New Mexico Chapters of The Wildlife Society and the Arizona/New Mexico Chapters of the American Fisheries Society, Safford AZ.
- November, 2003 – Invited Speaker New Mexico Council of Churches conference “Is Global Warming Too Hot to Handle?,” Albuquerque MN
- October, 2003 – Invited Plenary Speaker, Panel Member and Press Conference Participant, Study of Environmental Arctic Change (SEARCH) Open Science Meeting, Seattle, Washington
- September, 2003 – Invited Participant and Speaker, UN Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Second Scoping Meeting, Potsdam, Germany
- May, 2003 – Invited speaker, Inagural Meeting of the Arizona Governor’s Drought Task Force
- April, 2003 – Invited Participant and Speaker, UN Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment First Scoping Meeting, Potsdam, Germany
- April, 2003 – Invited Keynote Speaker, University of New Mexico Center for the Southwest Conference “Heating up: Coping with Climate Change in the Southwest”
- April, 2003 – Invited Plenary Speaker, International Limnogeology Congress, Tucson, AZ
- April, 2002 -- Keynote Speaker, NSF Workshop on “Antarctic Peninsula Climate Variability: A Historical and Paleoenvironmental Perspective,” Clinton, NY.
- April, 2002 -- Invited Speaker, University of New Mexico
- March, 2002 -- Invited seminar speaker, University of New Mexico
- March, 2002 -- Invited SEPM 2002 Annual Business Meeting Luncheon Distinguished Speaker, Houston, TX
- January 2002 -- Invited lunch speaker. “Regional climate services: The RISA* Experience” NOAA Climate Services Workshop, Columbia, Maryland.
- December 2001 -- Invited plenary speaker “Building Native Nations: Environmental, Natural Resources, and Governance” conference, Tucson, AZ
- August 2001 -- Invited plenary speaker, *IGBP PAGES - PEP3: Past Climate Variability Through Europe and Africa*, August 2001, Aix-en-Provence, France.
- November, 2001 -- Laboratory for Tree-ring Research, Colloquium, November 2001

- April 2001 -- Invited Speaker, NOAA Climate Diagnostics Lab, Boulder, CO
- April 2001 -- Attended lunch briefing with Arizona Congressmen Kolbe and Flake to discuss University of Arizona interaction with Columbia University and the Biosphere 2 Center, Washington, DC
- April 2001 -- Invited Speaker, NSF Workshop "Reconstructing Late Holocene Climate," Charlottesville, VA
- April 2001 -- Invited speaker, University of Arizona Math Awareness Week
- March 2001 -- Invited seminar speaker, Scripps Institute of Oceanography
- March 2001 -- Invited seminar speaker, University of Minnesota
- March 2001 -- Invited speaker at NSF PARCS workshop, Amherst Massachusetts
- March 2001 -- Invited speaker and Earth System Science advisor, University of Wyoming
- February 2001 -- "Climate, fire and the need for a national climate service." NOAA-USDA Fire and Climate 2001 Workshop, Tucson, AZ.
- January, 2001 -- Invited speaker at *NASA/IPRC Colloquium on Decadal Climate Variability*, Honolulu HI
- September 2000 -- Invited speaker, Annual Meeting of The Nature Conservancy, Tucson, AZ
- July 2000 -- Invited participant and speaker, Yale/NBER/IIASA program on International Environmental Economics Workshop on "Potential Catastrophic Impacts of Climate Change", Snowmass, CO
- August 2000 -- Gave invited lecture to UA Ecology and Evolutionary Biology Dept. as part of their seminar series
- May 2000 -- Gave talk "A global perspective on climate change" to US Department of State "Senior Seminar," Tucson, AZ
- March 2000 -- Gave invited Holmes lecture, Syracuse University.
- December, 1999 -- Gave invited lecture to UA Geography Dept. as part of their seminar series
- October, 1999 -- Invited Speaker/Panelist "Hot Topics" Session entitled "Climates Change, Get With It!" at 1999 Annual Meeting of the Geological Society of America, Denver, CO.
- November, 1999 -- Invited Panelist and Speaker in "Special Symposium on Global Warming" at the 1999 American Nuclear society Winter Meeting (Long Beach, CA). Talk titled "Measuring climate change: climates and climate changes of the past."
- August, 1999 -- Invited participant and speaker, Aspen Global Change Institute on "Ecological and Agricultural Consequences of Past, Present and Future Climatic Extremes," Aspen, CO.
- August, 1999 -- Gave invited seminar on recent climate change at University of Durban, South Africa
- August, 1999 -- Gave three invited short-course/demonstration of The World Data Center-A for Paleoclimatology system, International Quaternary Association Meeting, Durban, South Africa. Included television interviews with South African Broadcasting Service.
- May, 1999 -- Invited speaker/participant NASA Team Meeting (Arlie, VA) Presented overview of "Assessing Future Stability of US High Plains Landcover: Integration of Process Modeling with Landsat, In Situ Modern and Paleoclimate Data"
- Spring, 1999 -- Invited lecturer, Trinity College, Dublin
- June, 1998 -- Invited lecturer, European Commission Advanced Study Course on Holocene Climate Reconstruction, Environmental Change Research Centre, University College, London
- June, 1998 -- Invited Participant, US-European Commission Conference "New Vistas in Transatlantic Science and Technology Cooperation," Washington, DC.
- April, 1998 -- Invited Speaker, IGBP PAGES Open Science Meeting, London, England.
- February, 1998 -- Invited Participant, Sixth Japan-U.S. Workshop on Global Change Research, Honolulu, Hawaii
- February, 1998 -- Nominated for Lead Author, 2000 Intergovernmental Panel on Climate Change (IPCC)
- February, 1998 -- Invited Plenary Speaker and Participant, IGBP PAGES 2nd International Workshop on Global Paleoenvironmental Data, Boulder, Colorado
- January, 1989 -- Invited Speaker, National Science Foundation Earth System History Interagency Briefing, Washington, DC
- January, 1989 -- Invited Speaker, US Global Change Research Program Congressional Seminar Series, Washington, DC

- January, 1998 to 2000 -- Invited Content Advisor, Smithsonian Institution's planned new "Forces of Change" National Museum of Natural History exhibit and "From Grass to Grain" traveling exhibit.
- January, 1997 to 1998 -- Senior US Scientist, Gore-Chernomyrdin US-Russia Environmental Working Group.
- December, 1997 -- Invited Seminar Speaker - University of Alaska-Fairbanks
- November, 1997 -- Preprint of Science paper "Arctic Environmental Change of the Last Four Centuries" sent by Dr. James Baker (Under Secretary for Oceans and Atmosphere) to Vice President Gore, along with explanatory memo).
- November, 1997 -- Invited seminar speaker - McGill University, Montreal
- November, 1997 -- Invited seminar speaker - University of Montreal, Montreal
- November, 1997 -- Invited seminar speaker - UC Santa Cruz, Santa Cruz, CA
- November, 1997 -- Invited participant, IGBP PAGES (Past Global Changes) Leader Meeting, Hilterfingen, Switzerland
- September, 1997 -- Invited participant and speaker, WCRP CLIVAR Science meeting, Abisko, Sweden.
- June, 1997 -- Invited participant and speaker, National Center for Atmospheric Research "Climate System Model" workshop. Breckenridge, CO
- May, 1997 -- Invited Speaker, NSF ARCSS OAI Principal Investigators Meeting, Virginia Beach.
- Winter, 1997 -- Member - NSF Arctic System Science (ARCSS) Science Integration Plan Writing Team.
- April, 1996 -- Plenary Speaker and Working Group Co-Chair, Arctic System Science (ARCSS) All-Hands Workshop, Utah
- Spring, 1996 -- Member, Ocean Drilling Program Leg 165 Science Party
- February, 1996 -- invited speaker at first ever joint meeting of the NRC (National Research Council) "GOALS" and "DEC-CEN" climate research panels, Irvine, CA.
- October, 1995 -- Speaker and Working Group Leader, All World Data Center Meeting, Netherlands
- April, 1995 -- Invited participant, speaker and discussion leader "International Himalayan/Tibetan Plateau Paleoclimate Workshop" Kathmandu, Nepal
- 1994-1997 -- Collaborator on funded National Science Foundation Grant ATM-94: "Long-term dynamics of the SW Indian monsoon: New high-resolution paleoclimatic data from Tibet" (funding thru Dr. K-B Liu).
- April, 1994 -- Invited participant, IGBP PAGES workshop and planning meeting "PEPII - Pole-Equator-Pole Australasia transect," Beijing, China.
- 1991 to present -- Invited participant, and representative of the NOAA Paleoclimatology Program, at 2-3 meetings per year of the NOAA Panel on Climate and Global Change
- October, 1994 -- Invited participant, NATO Workshop "Climatic variability and forcing mechanisms of the last 2000 years." Tuscany, Italy
- December, 1993 -- Guest Editor, Special Issue of *Quaternary Science Reviews*, "Decadal to Millennial-scale Variability in the Climate System"
- December, 1993 -- Invited participant and co-author of IGBP PAGES workshop report "PEPIII - Pole-Equator-Pole Europe-Africa Transect," Bern Switzerland.
- October, 1993 -- Invited participant, NATO Workshop "Strategies for the use of paleoclimatic data sets in climate model intercomparison and evaluation," Aussois, France.
- April, 1993 -- Invited participant, speaker, and group leader at IGBP Workshop "High-resolution records of past climate from monsoon Asia," Taipei, Taiwan.
- March, 1993 -- Invited participant and speaker, NSF-Russian Workshop "Paleoclimates of Arctic Lakes and Estuaries," Vladivostok, Russia. Co-authored protocols for international collaboration in the study of Arctic paleoclimates using lake sediments.

- December, 1992 -- IGBP PAGES representative to meeting of the IGBP-DIS Standing Committee and to discussions of joint PAGES-IGBP GCTE (Global Change and Terrestrial Ecosystems) research, Canberra, Australia.
- December, 1992 -- Invited lecturer at the Research School of Biological Sciences at the Australian National University.
- November, 1992 -- Invited participant and speaker at the Advisory Committee on Nuclear Waste Working Group Meeting: "On the impact of long-range climate change in the area of the southern Basin and Range," Washington, DC.
- September, 1992 -- Invited participant in NOAA-sponsored workshop "Human Dimensions of Global Change," Washington, DC.
- September, 1992 to May, 1994 -- Gave hour-long invited seminars at the University of Colorado (Geological Sciences), the NOAA Geophysical Fluid Dynamics Lab (Princeton), the Colorado School of Mines (Geology), The University of Wyoming (Geology), the University of Massachusetts (Geography and Geology) and the University of Washington (Quaternary Research Center - two lectures).
- December, 1991 -- Invited participant, Dahlem Workshop on "Global Changes in the Perspective of the Past," Berlin, Germany.
- November, 1991 -- Invited participant and discussion leader, NOAA/NASA/NSF Workshop: "Late Quaternary Paleoclimate Model Boundary Conditions," New York.
- September, 1991 -- Invited Guest and Lecturer, Center for Climate System Research, University of Tokyo.
- June, 1991 -- Invited member, US delegation to meeting of Working Group VIII (Influences of Environmental Changes on Climate) of the US/USSR Agreement on Protection of the Environment, Bellagio, Italy.
- March, 1991 -- Invited participant and Theme Leader, First meeting of the Scientific Steering Committee of the IGBP Past Global Changes (PAGES) Core Project, Mainz, Germany.
- August, 1990 -- Invited participant and paleoclimatology representative - U.S. (NSF/NASA) Bilateral Agreement with the People's Republic of China (State Meteorology Agency) Climate Workshop, Shanghai, PRC.
- January, 1990 -- Invited participant, GICME II Workshop - "Geological Indicators of Climate from Marine Environments," St. Petersburg, FL.
- November, 1989 -- Invited participant, EPA/OPPE "Workshop on Tropical Forests," Washington DC.
- August - September 1989 -- Visiting Scientist, Laboratoire de Palynologie C.N.R.S., Montpellier, France.
- July - August 1989 -- Invited participant, Second UCAR/OIES Global Change Institute, "Explaining records of past global change," Snowmass, Colorado.
- July, 1989 -- Invited contributor and speaker, "Global Climate Change and its Effects on California," Davis, California.
- 1989 - 1990 -- Original member of the NOAA Paleoclimate Advisory Panel.
- November-December 1988 -- Visiting Scientist, Laboratoire de Palynologie C.N.R.S., Montpellier, France.
- September 1988 -- Invited participant, Committee on the Earth Sciences review of methodologies for EPA's reports to Congress, Washington DC.
- August 1988 -- Elected Vice-Chairperson/ Chair-Elect of the Paleoecology Section of the Ecological Society of America.
- April 1988 -- Invited participant, NSF workshop on Arctic Lake Coring, Boulder, Colorado.
- April 1988 -- Review workshop for EPA's Report to Congress on the Effects of a Global Warming, Bethesda, Maryland.
- February 1988 -- Invited participant and speaker, NSF/NOAA Paleoecology workshop: "A meeting on the present status and future of studies of the paleosedimentary records of

- nearshore marine and freshwater lakes related to climate and global change," Boston, Massachusetts.
- October 1987 -- Invited participant, U.S. EPA Meeting of the Principal Investigators for "The Report to Congress on the Effects of a Global Warming," Alexandria, Virginia.
- September 1987 -- Invited participant, U.S. EPA Workshop: "Global Climate Change Research Plan," Raleigh, North Carolina.
- May 1987 -- Invited participant and speaker, NSF (Division of Polar Programs) workshop: "The Contribution of Lake Sediments to Arctic Paleoenvironmental Reconstructions," Boulder, Colorado.
- April 1987 -- Invited participant, U.S. EPA Workshop: "Ecological Effects of Global Climate Change," Boulder, Colorado.
- April 1987 -- Invited participant and speaker: "United Nations Meeting of Experts on Space Technology and its Applications within the Framework of Educational Systems," Lagos, Nigeria.
- 1986 to present -- Reviewer for U.S. EPA, NSF, DOE, NOAA, NGS, ODP, USGS, NPS, several foreign funding agencies, and numerous scientific journals.
- 1986 - Consultant to the U.S. EPA.
- 1984 to 1986 -- Member COHMAP (Cooperative Holocene Mapping Project).

PROFESSIONAL MEMBERSHIPS

American Association for the Advancement of Science
 American Geophysical Union
 American Meteorological Society
 American Quaternary Association
 Ecological Society of America
 Geological Society of America
 Sigma Xi

PUBLICATIONS (Peer-reviewed journals and book chapters)

107. Karl, T.R., J. M. Melillo, and T. C. Peterson, (eds.). Global Climate Change Impacts in the United States, Cambridge University Press, 2009 (released at White House press conference).
106. Kaufman, D.S., D. P. Schneider, N. P. McKay, C. M. Ammann, R. S. Bradley, K. R. Briffa, G. H. Miller, B. L. Otto-Bleisner, J. T. Overpeck, B.M. Vinther and Arctic Lakes 2k Project Members (2009). Recent Warming Reverses Long-Term Arctic Cooling. *Science* 325, 1236-1239.
105. Shanahan, T., J.T. Overpeck, K. Anchukaitis, Jeffery E. Pigati, J. Peck, J.W. King and C.A. Scholz (2009). Asynchronous late-Holocene collapse of the West African Monsoon. (to be submitted to PNAS)
104. Shanahan, T., J.T. Overpeck, K. Anchukaitis, J.W. Beck, J.E. Cole, D. Dettman, J. Peck, C.A. Scholz, and J.W. King (2009). Atlantic forcing of persistent drought in West Africa *Science* 324, 377-380.
103. Shanahan, T. M., Overpeck, J. T., Beck, J. W., Wheeler, C. W., Peck, J. A., King, J. W., and Scholz, C. A. (2008). The formation of biogeochemical laminations in Lake Bosumtwi, Ghana, and their usefulness as indicators of past environmental changes. *Journal of Paleolimnology* 40, 339-355.
102. National Research Council (2008). *Ecological Impacts of Climate Change*, 57 pp., National Academy Press, Washington, D.C., 2003 (Overpeck is a co-author).
101. Weiss, J.L., C. L. Castro and J. T. Overpeck. (2009). The changing character of climate, drought, and the seasons in the Southwestern U.S.A. *Journal of Climate* 22: 5918-5932.
100. *Conroy' J. L., J.T. Overpeck, J.E. Cole and M. Steinitz-Kannan. (2009). Variable oceanic teleconnections to Western North American drought over the last 1200 years. *Geophysical Research Letters* 36: L17703 10.1029/2009gl039558

99. Jones P.D., K.R. Briffa, T.J. Osborn, J.M. Lough, T.D. van Ommen, B.M. Vinther, J. Luterbacher, E. R. Wahl, F.W. Zwiers, M.E. Mann, G.A. Schmidt, C. M. Ammann, B.M. Buckley, K. M. Cobb, J. Esper, H. Goosse, N. Graham, E. Jansen, T. Kiefer, C. Kull, M. Küttel, E. Mosley-Thompson, J.T. Overpeck, N. Riedwyl, M. Schulz, A. W. Tudhope, R. Villalba, H. Wanner, E. Wolff and E. Xoplaki (2009). High-resolution paleoclimatology of the last millennium: a review of current status and future prospects. *The Holocene* 19, 3-49.
98. Overpeck, J.T. and J.E. Cole (2008). The rhythm of the rains. *Nature* 451, 1061-1063.
97. Conroy J. L., A. Restrepo, J.T. Overpeck, M. Steinitz-Kannan, J.E. Cole, M B. Bush and P. A. Colinvaux (2009). Unprecedented recent warming of surface temperatures in the eastern tropical Pacific Ocean. *Nature Geoscience* 2, 46-50; plus featured as issue "Backstory".
96. Conroy J. L., J.T. Overpeck, J.E. Cole, T.M. Shanahan, and M. Steinitz-Kannan. (2007). Holocene changes in eastern tropical Pacific climate inferred from a Galápagos lake sediment record. *Quaternary Science Reviews* 27, 1168-1180.
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- Overpeck, J.T. 2005. "The Realities of Climate Change," Annual Conference of the New Mexico Public Health Association, Albuquerque, New Mexico.
- Overpeck, J.T. 2005. "Climate Change in the Southwest: Past, Present and Future," Climate Change & Ecosystem Impacts in Southwest Forests and Woodlands Workshop, Sedona, Arizona.
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- Overpeck, J.T. 2004. "A Paleoenvironmental Perspective on Future Climate Change." 37th Annual Joint meeting of the Arizona and New Mexico Chapters of The Wildlife Society and the Arizona/New Mexico Chapters of the American Fisheries Society, Safford AZ.
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- Overpeck, J.T. 2000. "Overview: Paleoclimate Records," NASA Workshop on Solar Influences on Climate, Tucson, AZ.
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- Overpeck, J.T. 1988. "Modeling the transient response of vegetation to climatic change: a paleoecologic time series perspective." Ecological Society of America Annual Meeting, Davis, California
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- Overpeck, J.T. and E.R. Cook. 1987. "A Quaternary perspective on how trace-gas-induced climate change might affect natural vegetation: data and methods." XII-th Congress of the International Quaternary Association, Ottawa, Canada.
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- Overpeck, J.T. and P.J. Bartlein. 1984. "Time series analysis of a 1000-year high-resolution pollen record from north-central Wisconsin." International Palynological Conference.

Report of the International Panel set up by the University of East Anglia to examine the research of the Climatic Research Unit.

Introduction

1. The Panel was set up by the University in consultation with the Royal Society to assess the integrity of the research published by the Climatic Research Unit in the light of various external assertions. The Unit is a very small academic entity within the School of Environmental Sciences. It has three full time and one part time academic staff members and about a dozen research associates, PhD students and support staff. The essence of the criticism that the Panel was asked to address was that climatic data had been dishonestly selected, manipulated and/or presented to arrive at pre-determined conclusions that were not compatible with a fair interpretation of the original data. The members of the Panel are listed in Appendix A at the end of this report.
2. The Panel was not concerned with the question of whether the conclusions of the published research were correct. Rather it was asked to come to a view on the integrity of the Unit's research and whether as far as could be determined the conclusions represented an honest and scientifically justified interpretation of the data. The Panel worked by examining representative publications by members of the Unit and subsequently by making two visits to the University and interviewing and questioning members of the Unit. Not all the panel were present on both occasions but two members were present on both occasions to maintain continuity. About fifteen person/days were spent at the University discussing the Unit's work.
3. The eleven representative publications that the Panel considered in detail are listed in Appendix B. The papers cover a period of more than twenty years and were selected on the advice of the Royal Society. All had been published in international scientific journals and had been through a process of peer review. CRU agreed that they were a fair sample of the work of the Unit. The Panel was also free to ask for any other material that it wished and did so. Individuals on the panel asked for and reviewed other CRU research materials.
4. The Panel's work began with a detailed reading of the published work. Every paper was read by a minimum of three Panel members at least one of whom was familiar with the general area to which the paper related. At least one of the other two was a generalist with no special climate science expertise but with experience of some of the general techniques and methods employed in the work. Most of the members of the Panel read all the publications. The publications provided a platform from which to gain a deeper understanding of the Unit's research and enabled the Panel to probe particular questions in more detail.

5. Broadly the work of the Unit falls into two parts:
 - Construction and interpretation of tree ring chronologies extending over some thousands of years with a view to gaining information about past climates:
 - Studies of temperatures over the last few hundred years from direct observations.

Dendroclimatology

1. Tree growth is sensitive to very many factors including climate. By piecing together growth records from different trees, living or dead, it is possible to determine the temporal variation of growth patterns going back many hundreds of years. The dendroclimatological work at CRU seeks to go beyond this and to extract from the dated growth patterns the local and regional history of temperature variations. The Unit does virtually no primary data acquisition but has used data from published archives and has collaborated with people who have collected data.
2. The main effort of the dendroclimalogists at CRU is in developing ways to extract climate information from networks of tree ring data. The data sets are large and are influenced by many factors of which temperature is only one. This means that the effects of long term temperature variations are masked by other more dominant short term influences and have to be extracted by statistical techniques. The Unit approaches this task with an independent mindset and awareness of the interplay of biological and physical processes underlying the signals that they are trying to detect.
3. Although inappropriate statistical tools with the potential for producing misleading results have been used by some other groups, presumably by accident rather than design, in the CRU papers that we examined we did not come across any inappropriate usage although the methods they used may not have been the best for the purpose. It is not clear, however, that better methods would have produced significantly different results. The published work also contains many cautions about the limitations of the data and their interpretation.
4. Chronologies (transposed composites of raw tree data) are always work in progress. They are subject to change when additional trees are added; new ways of data cleaning may arise (e.g. homogeneity adjustments), new measurement methods are used (e.g. of measuring ring density), new statistical methods for treating the data may be developed (e.g. new ways of allowing for biological growth trends).
5. This is illustrated by the way CRU check chronologies against each other; this has led to corrections in chronologies produced by others. CRU is to be commended for continuously updating and reinterpreting their earlier chronologies.

6. With very noisy data sets a great deal of judgement has to be used. Decisions have to be made on whether to omit pieces of data that appear to be aberrant. These are all matters of experience and judgement. The potential for misleading results arising from selection bias is very great in this area. It is regrettable that so few professional statisticians have been involved in this work because it is fundamentally statistical. Under such circumstances there must be an obligation on researchers to document the judgemental decisions they have made so that the work can in principle be replicated by others.
7. CRU accepts with hindsight that they should have devoted more attention in the past to archiving data and algorithms and recording exactly what they did. At the time the work was done, they had no idea that these data would assume the importance they have today and that the Unit would have to answer detailed inquiries on earlier work. CRU and, we are told, the tree ring community generally, are now adopting a much more rigorous approach to the archiving of chronologies and computer code. The difficulty in releasing program code is that to be understood by anyone else it needs time-consuming work on documentation, and this has not been a top priority.
8. After reading publications and interviewing the senior staff of CRU in depth, we are satisfied that the CRU tree-ring work has been carried out with integrity, and that allegations of deliberate misrepresentation and unjustified selection of data are not valid. In the event CRU scientists were able to give convincing answers to our detailed questions about data choice, data handling and statistical methodology. The Unit freely admits that many data analyses they made in the past are superseded and they would not do things that way today.
9. We have not exhaustively reviewed the external criticism of the dendroclimatological work, but it seems that some of these criticisms show a rather selective and uncharitable approach to information made available by CRU. They seem also to reflect a lack of awareness of the ongoing and dynamic nature of chronologies, and of the difficult circumstances under which university research is sometimes conducted. Funding and labour pressures and the need to publish have meant that pressing ahead with new work has been at the expense of what was regarded as non-essential record keeping. From our perspective it seems that the CRU sins were of omission rather than commission. Although we deplore the tone of much of the criticism that has been directed at CRU, we believe that this questioning of the methods and data used in dendroclimatology will ultimately have a beneficial effect and improve working practices

Temperatures from Historical Instrumental Records

1. The second main strand of work at CRU has been the collection and collation of instrumental land temperature records from all over the world and the construction of regional, hemispherical and global scale temperature records. These records are irregularly distributed in space and time. Modern records come largely from land-based meteorological stations but their geographical distribution is uneven and strongly biased in favour of the northern hemisphere

where most of the Earth's land masses are located. Oceans cover two thirds of the Earth's surface and away from the main shipping routes coverage is thin. For earlier centuries the record is much sparser. Deriving estimates of past temperatures on a global, hemispheric and regional scale from incomplete data sets is one of the problems faced by the Unit and in consequence an important current interest is the discovery of useable old temperature records from a variety of sources.

2. In the latter part of the 20th century CRU pioneered the methods for taking into account a wide range of local influences that can make instrumental records from different locations hard to compare. These methods were very labour intensive and were somewhat subjective. Much of this work was supported by the US Department of Energy and was published with the details of station corrections several times a year. Since the 1980s the Unit has done no more of this work and have concentrated on the merging and interpretation of data series corrected by others. There have been various analyses of similar publicly available data sets by different international groups. Although there are some differences in fine detail that reflect the differences in the analytical methods used, the results are very similar.
3. The Unit has devoted a great deal of effort to understanding how instrumental observations are best combined to derive the surface temperature on a variety of time and space scales. It has become apparent from a number of studies that there is elevation of the surface temperature in and around large cities and work is continuing to understand this fully.
4. Like the work on tree rings this work is strongly dependent on statistical analysis and our comments are essentially the same. Although there are certainly different ways of handling the data, some of which might be superior, as far as we can judge the methods which CRU has employed are fair and satisfactory. Particular attention was given to records that seemed anomalous and to establishing whether the anomaly was an artefact or the result of some natural process. There was also the challenge of dealing with gaps in otherwise high quality data series. In detailed discussion with the researchers we found them to be objective and dispassionate in their view of the data and their results, and there was no hint of tailoring results to a particular agenda. Their sole aim was to establish as robust a record of temperatures in recent centuries as possible. All of the published work was accompanied by detailed descriptions of uncertainties and accompanied by appropriate caveats. The same was true in face to face discussions.
5. We believe that CRU did a public service of great value by carrying out much time-consuming meticulous work on temperature records at a time when it was unfashionable and attracted the interest of a rather small section of the scientific community. CRU has been among the leaders in international efforts to determining the overall uncertainty in the derived temperature records and where work is best focussed to improve them.

6. The Unit has demonstrated that at a global and hemispheric scale temperature results are surprisingly insensitive to adjustments made to the data and the number of series included.
7. Recent public discussion of climate change and summaries and popularizations of the work of CRU and others often contain oversimplifications that omit serious discussion of uncertainties emphasized by the original authors. For example, CRU publications repeatedly emphasize the discrepancy between instrumental and tree-based proxy reconstructions of temperature during the late 20th century, but presentations of this work by the IPCC and others have sometimes neglected to highlight this issue. While we find this regrettable, we could find no such fault with the peer-reviewed papers we examined

Conclusions

1. We saw no evidence of any deliberate scientific malpractice in any of the work of the Climatic Research Unit and had it been there we believe that it is likely that we would have detected it. Rather we found a small group of dedicated if slightly disorganised researchers who were ill-prepared for being the focus of public attention. As with many small research groups their internal procedures were rather informal.
2. We cannot help remarking that it is very surprising that research in an area that depends so heavily on statistical methods has not been carried out in close collaboration with professional statisticians. Indeed there would be mutual benefit if there were closer collaboration and interaction between CRU and a much wider scientific group outside the relatively small international circle of temperature specialists.
3. It was not the immediate concern of the Panel, but we observed that there were important and unresolved questions that related to the availability of environmental data sets. It was pointed out that since UK government adopted a policy that resulted in charging for access to data sets collected by government agencies, other countries have followed suit impeding the flow of processed and raw data to and between researchers. This is unfortunate and seems inconsistent with policies of open access to data promoted elsewhere in government.
4. A host of important unresolved questions also arises from the application of Freedom of Information legislation in an academic context. We agree with the CRU view that the authority for releasing unpublished raw data to third parties should stay with those who collected it.

Submitted to the University 12 April 2010

Addendum to report, 19 April 2010

For the avoidance of misunderstanding in the light of various press stories, it is important to be clear that neither the panel report nor the press briefing intended to imply that any research group in the field of climate change had been deliberately misleading in any of their analyses or intentionally exaggerated their findings. Rather, the aim was to draw attention to the complexity of statistics in this field, and the need to use the best possible methods.

APPENDIX A
PANEL MEMBERSHIP

Chair: Prof Ron Oxburgh FRS (Lord Oxburgh of Liverpool)

Prof Huw Davies, ETH Zürich

Prof Kerry Emanuel, Massachusetts Institute of Technology

Prof Lisa Graumlich, University of Arizona.

Prof David Hand FBA, Imperial College, London.

Prof Herbert Huppert FRS, University of Cambridge

Prof Michael Kelly FRS, University of Cambridge

APPENDIX B

Peer-reviewed publications for assessment.

1. Brohan, P., Kennedy, J., Harris, I., Tett, S.F.B. and Jones, P.D., 2006: Uncertainty estimates in regional and global observed temperature changes: a new dataset from 1850. *J. Geophys. Res.* **111**, D12106.
2. Briffa, K. R., F. H. Schweingruber, P. D. Jones, T. J. Osborn, S. G. Shiyatov, and E. A. Vaganov. 1998a. Reduced sensitivity of recent tree-growth to temperature at high northern latitudes. *Nature* **391**:678-682.
3. Briffa, K. R., F. H. Schweingruber, P. D. Jones, T. J. Osborn, I. C. Harris, S. G. Shiyatov, E. A. Vaganov, and H. Grudd, 1998b. Trees tell of past climates: but are they speaking less clearly today? *Philosophical Transactions of the Royal Society of London Series B – Biological Sciences* **353**, 65-73.
4. Briffa, K. R. 2000. Annual climate variability in the Holocene: interpreting the message of ancient trees. *Quaternary Science Reviews* **19**, 87-105.
5. Briffa, K.R., Osborn, T.J., Schweingruber, F.H., Harris, I.C., Jones, P.D., Shiyatov, S.G. and Vaganov, E.A., 2001: Low-frequency temperature variations from a northern tree-ring density network. *J. Geophys. Res.* **106**, 2929-2941.
6. Briffa, K. R., V. V. Shishov, T. M. Melvin, E. A. Vaganov, H. Grudd, R. M. Hantemirov, M. Eronen, and M. M. Naurzbaev. 2008. Trends in recent temperature and radial tree growth spanning 2000 years across northwest Eurasia. *Philosophical Transactions of the Royal Society B-Biological Sciences* **363**, 2271-2284.
7. Jones, P.D. and Moberg, A., 2003: Hemispheric and large-scale surface air temperature variations: An extensive revision and an update to 2001. *J. Climate* **16**, 206-223.
8. Jones, P.D., Raper, S.C.B., Bradley, R.S., Diaz, H.F., Kelly, P.M. and Wigley, T.M.L., 1986a: Northern Hemisphere surface air temperature variations: 1851-1984. *Journal of Climate and Applied Meteorology* **25**, 161-179.
9. Jones, P.D., Raper, S.C.B. and Wigley, T.M.L., 1986b: Southern Hemisphere surface air temperature variations: 1851-1984. *Journal of Climate and Applied Meteorology* **25**, 1213-1230.
10. Jones, P.D., Groisman, P.Ya., Coughlan, M., Plummer, N., Wang, W-C. and Karl, T.R., 1990: Assessment of urbanization effects in time series of surface air temperature over land. *Nature* **347**, 169-172.
11. Jones, P.D., Lister, D.H. and Li, Q., 2008: Urbanization effects in large-scale temperature records, with an emphasis on China. *Journal of Geophysical Research*, **113**, D16122.

Supporting documentation

Briffa and Melvin (2009) which is online at
<http://www.cru.uea.ac.uk/cru/people/briffa/yamal2009/>

TR017 – Bradley, R.S., Kelly, P.M., Jones, P.D., Goodess, C.M. and Diaz, H.F., 1985: A Climatic Data Bank for Northern Hemisphere Land Areas, 1851-1980, U.S. Dept. of Energy, Carbon Dioxide Research Division, *Technical Report TRO17*, 335 pp.

TR022 – Jones, P.D., Raper, S.C.B., Santer, B.D., Cherry, B.S.G., Goodess, C.M., Kelly, P.M., Wigley, T.M.L., Bradley, R.S. and Diaz, H.F., 1985: A Grid Point Surface Air Temperature Data Set for the Northern Hemisphere, U.S. Dept. of Energy, Carbon Dioxide Research Division, *Technical Report TRO22*, 251 pp.

TR027 – Jones, P.D., Raper, S.C.B., Cherry, B.S.G., Goodess, C.M. and Wigley, T.M.L., 1986: A Grid Point Surface Air Temperature Data Set for the Southern Hemisphere, 1851-1984, U.S. Dept. of Energy, Carbon Dioxide Research Division, *Technical Report TR027*, 73 pp.



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The disclosure of climate data from the Climatic Research Unit at the University of East Anglia

Eighth Report of Session 2009–10

Report, together with formal minutes

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REBUTTAL EXHIBIT 3**

The Science and Technology Committee

The Science and Technology Committee is appointed by the House of Commons to examine the expenditure, administration and policy of the Government Office for Science. Under arrangements agreed by the House on 25 June 2009 the Science and Technology Committee was established on 1 October 2009 with the same membership and Chairman as the former Innovation, Universities, Science and Skills Committee and its proceedings were deemed to have been in respect of the Science and Technology Committee.

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The Committee is one of the departmental Select Committees, the powers of which are set out in House of Commons Standing Orders, principally in SO No.152. These are available on the Internet via www.parliament.uk.

Publications

The Reports and evidence of the Committee are published by The Stationery Office by Order of the House. All publications of the Committee (including press notices) are on the Internet at <http://www.parliament.uk/science>. A list of reports from the Committee in this Parliament is included at the back of this volume.

Committee staff

The current staff of the Committee are: Glenn McKee (Clerk); Richard Ward (Second Clerk); Dr Christopher Tyler (Committee Specialist); Xameerah Malik (Committee Specialist); Andy Boyd (Senior Committee Assistant); Camilla Brace (Committee Assistant); Dilys Tonge (Committee Assistant); Melanie Lee (Committee Assistant); Jim Hudson (Committee Support Assistant); and Becky Jones (Media Officer).

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Summary

The disclosure of climate data from the Climatic Research Unit (CRU) at the University of East Anglia (UEA) in November 2009 had the potential to damage the reputation of the climate science and the scientists involved.

We believe that the focus on CRU and Professor Phil Jones, Director of CRU, in particular, has largely been misplaced. Whilst we are concerned that the disclosed e-mails suggest a blunt refusal to share scientific data and methodologies with others, we can sympathise with Professor Jones, who must have found it frustrating to handle requests for data that he knew—or perceived—were motivated by a desire simply to undermine his work.

In the context of the sharing of data and methodologies, we consider that Professor Jones's actions were in line with common practice in the climate science community. It is not standard practice in climate science to publish the raw data and the computer code in academic papers. However, climate science is a matter of great importance and the quality of the science should be irreproachable. We therefore consider that climate scientists should take steps to make available all the data that support their work (including raw data) and full methodological workings (including the computer codes). Had both been available, many of the problems at UEA could have been avoided.

We are content that the phrases such as “trick” or “hiding the decline” were colloquial terms used in private e-mails and the balance of evidence is that they were not part of a systematic attempt to mislead. Likewise the evidence that we have seen does not suggest that Professor Jones was trying to subvert the peer review process. Academics should not be criticised for making informal comments on academic papers.

In the context of Freedom of Information (FOIA), much of the responsibility should lie with UEA. The disclosed e-mails appear to show a culture of non-disclosure at CRU and instances where information may have been deleted, to avoid disclosure. We found *prima facie* evidence to suggest that the UEA found ways to support the culture at CRU of resisting disclosure of information to climate change sceptics. The failure of UEA to grasp fully the potential damage to CRU and UEA by the non-disclosure of FOIA requests was regrettable. UEA needs to review its policy towards FOIA and re-assess how it can support academics whose expertise in this area is limited.

The Deputy Information Commissioner has given a clear indication that a breach of the Freedom of Information Act 2000 may have occurred but that a prosecution was time-barred; however no investigation has been carried out. In our view it is unsatisfactory to leave the matter unresolved. We conclude that the matter needs to be resolved conclusively—either by the Independent Climate Change Email Review or by the Information Commissioner.

We accept the independence of the Climate Change E-mail Review and recommend that the Review be open and transparent, taking oral evidence and conducting interviews in public wherever possible.

On 22 March UEA announced the Scientific Appraisal Panel to be chaired by Lord

Oxburgh. This Panel should determine whether the work of CRU has been soundly built and it would be premature for us to pre-judge its work.

1 Introduction

1. On Friday 20 November 2009 it was reported across the world that hackers had targeted a “leading climate research unit”¹ and that e-mails from the University of East Anglia’s (UEA) Climatic Research Unit (CRU), one of the world’s foremost centres of climate science, had been published in the internet.² The story of the substantial file of private e-mails, documents and data that had been leaked helped ignite the global warming debate in the run up to the Copenhagen climate change conference in December 2009. As reported by the press, exchanges on the internet alleged that data had been manipulated or deleted, in order to support evidence on global warming.

The Climatic Research Unit at UEA

2. UEA was founded in 1963 and in 1972 UEA established CRU.³ CRU’s website describes the Unit as being “widely recognised as one of the world’s leading institutions concerned with the study of natural and anthropogenic [human caused] climate change”.⁴ CRU has a staff of around thirty research scientists and students.⁵ But as we heard in oral evidence, it is in fact “a very small Unit [with only] three full-time members of academic staff”.⁶

3. CRU has developed a number of the datasets widely used in climate research, including the global temperature record used to monitor the state of the climate system, as well as statistical software packages and climate models. In its written submission to the inquiry UEA outlined CRU’s “pioneering role” in the science of understanding the world’s changing climate. CRU’s contributions included the compilation of a global land temperature record and the development of increasingly sophisticated methods by which to represent the average temperature of the globe and changes in that average over time.⁷ Professor Edward Acton, the Vice-Chancellor of UEA, indicated that he was “immensely proud of what they have done; [as] without them humanity would be vastly less able to understand climate change.”⁸

The disclosure of climate data

4. In mid November 2009 it appeared that a server used by CRU had been accessed with 160 MB of data containing more than 1,000 e-mails and 3,000 other documents being

1 “Hackers target leading climate research unit”, *BBC News website*, 20 November 2009 news.bbc.co.uk/1/hi/sci/tech/8370282.stm

2 For example: “Hacked E-Mail Is New Fodder for Climate Dispute”, *New York Times website*, 21 November 2009 www.nytimes.com/2009/11/21/science/earth/21climate.html?_r=4 and “Hackers leak emails, stoking climate debate”, *Sydney Morning Herald website*, 23 November 2009, www.smh.com.au/technology/technology-news/hackers-leak-emails-stoking-climate-debate-20091123-iu6u.html

3 Ev 17, paras 1.2 and 1.5

4 “About the Climatic Research Unit”, CRU website, www.cru.uea.ac.uk/cru/about/

5 As above

6 Q 92

7 Ev 17, paras 1.5-1.6

8 Q 152

copied.⁹ A UEA spokeswoman confirmed that the information was not available on a server that could be easily accessed and could not have been inadvertently released.¹⁰ It is not known exactly when the breach occurred; the RealClimate website, “a commentary site on climate science by working climate scientists for the interested public and journalists”,¹¹ indicated that UEA had been notified of the possible security breach on 17 November.¹² The following was posted anonymously on the climate-sceptic blog, *The Air Vent*:

November 17, 2009 at 9:57 pm

We feel that climate science is, in the current situation, too important to be kept under wraps.

We hereby release a random selection of correspondence, code, and documents. Hopefully it will give some insight into the science and the people behind it.¹³

From here the debate was “blown wide open”.¹⁴ *The Guardian* ran the story on 20 November with the headline: “Climate sceptics claim leaked e-mails are evidence of collusion among scientists”.¹⁵

5. UEA issued a statement on 20 November: “This information has been obtained and published without our permission and we took immediate action to remove the server in question from operation. We are undertaking a thorough internal investigation and we have involved the police in this inquiry.”¹⁶ The e-mails contained technical and routine aspects of climate research, including data analysis and details of scientific conferences. The controversy has focused on a small number of e-mails, particularly those sent to, or written by, climatologist Professor Phil Jones, the Director of CRU.

The aftermath

6. Condemnation of alleged malpractices found within the leaked CRU e-mails was quickly disseminated on the internet. Contributors to climate change debate websites and written submissions to us claimed that these e-mails showed a deliberate and systematic attempt by leading climate scientists to manipulate climate data, arbitrarily adjusting and “cherry-picking” data that supported their global warming claims and deleting adverse data that questioned their theories.¹⁷ It was alleged that UEA may not have complied with the requirements of the Freedom of Information Act 2000, that inappropriate statistical methods and defective computer programmes may have been used to analyse data and that

9 RealClimate website archive, November 2009, www.realclimate.org/index.php/archives/2009/11/the-cru-hack

10 “Scotland Yard call in to probe climate data leak from UEA in Norwich”, *Norwich Evening News*, 1 December 2009

11 RealClimate website ‘about’ page, www.realclimate.org

12 RealClimate website archive, November 2009, www.realclimate.org/index.php/archives/2009/11/the-cru-hack; the data may have been downloaded on to the RealClimate—see paragraph 12.

13 The Air Vent website, November 2009 archive, noconsensus.wordpress.com/2009/11/page/3/

14 *As above*

15 “Climate sceptics claim leaked emails are evidence of collusion among scientists”, *The Guardian*, 20 November 2009

16 “Sceptics publish climate e-mails ‘stolen from East Anglia University’”, *The Times*, 21 November 2009

17 For examples see Ev 85 [Roger Helmer MEP], Ev 92 [Godfrey Bloom MEP], and Ev 144 [Stephen McIntyre]

CRU may have attempted to abuse the process of peer review to prevent the publication of research papers with conflicting opinions about climate change.¹⁸

7. In a statement released on 24 November, Professor Trevor Davies, UEA pro-Vice-Chancellor with responsibility for research, rejected calls for Professor Jones's resignation: "We see no reason for Professor Jones to resign and, indeed, we would not accept his resignation. He is a valued and important scientist."¹⁹ He also contested several of the claims of malpractice: "It is well known within the scientific community and particularly those who are sceptical of climate change that over 95% of the raw station data has been accessible through the Global Historical Climatology Network for several years. We are quite clearly not hiding information which seems to be the speculation on some blogs and by some media commentators". He added:

There is nothing in the stolen material which indicates that peer-reviewed publications by CRU, and others, on the nature of global warming and related climate change are not of the highest-quality of scientific investigation and interpretation. CRU's peer-reviewed publications are consistent with, and have contributed to, the overwhelming scientific consensus that the climate is being strongly influenced by human activity.²⁰

8. On 1 December, Professor Jones announced that he would step aside from the Director's role during the course of the independent review.²¹

The independent inquiries set up by UEA

9. On 3 December UEA announced that an independent review—the Independent Climate Change Email Review—into the allegations made against CRU would be carried out by Sir Muir Russell.²² Professor Acton explained in a letter to us why Sir Muir was chosen to head the review:

Sir Muir is extremely experienced in public life, has an understanding of the conduct of universities and research, and is entirely independent of any association with this University and with the climate change debate.²³

10. Alongside the Independent Climate Change E-Mails Review, UEA decided on a separate scientific assessment of CRU's key scientific publications; an external reappraisal of the science itself. The Royal Society agreed to assist UEA in identifying assessors with the requisite experience, standing and independence.²⁴ UEA announced on 22 March that Lord Oxburgh FRS would "chair an independent Scientific Assessment Panel to examine

18 For examples see Ev 90 [Phillip Bratby]; Ev 115 [David Holland], para 2; Ev 144 [Stephen McIntyre]; Ev 194 [Peabody Energy Company], para 24.

19 "Climate scientist at centre of leaked email row dismisses conspiracy claims", *The Guardian*, 24 November 2009

20 UEA, "CRU update 2", 24 November 2009, www.uea.ac.uk/mac/comm/media/press/2009/nov/CRUupdate

21 UEA, "CRU update 3", 1 December 2009, www.uea.ac.uk/mac/comm/media/press/2009/nov/CRUupdate

22 "Sir Muir Russell to head the Independent Review into the allegations against the Climatic Research Unit (CRU)", UEA Press Release, 3 December 2009, www.uea.ac.uk/mac/comm/media/press/2009/dec/CRUreview

23 Ev 16

24 Ev 18, para 2.3

important elements of the published science of the Climatic Research Unit (CRU) at the University of East Anglia”.²⁵

Our inquiry

11. We were concerned by the press reports and on 1 December 2009 the Chair of the Committee wrote to the Vice-Chancellor of UEA. The letter explained that we took a close interest in academic integrity and the systems in place to ensure the quality of evidence from research and evidence-based policy making. The letter requested a note on the recent events setting out:

- a) what had taken place;
- b) the steps that had been taken to investigate the allegations and to test the integrity of the data held and used by CRU;
- c) how CRU justified its commitment to academic transparency; and
- d) how the Vice-Chancellor proposed to restore confidence in CRU and its handling of data.

We also asked for an assurance that none of the data referred to in the e-mails that had been publicised had been destroyed.²⁶

12. UEA replied on 10 December 2009. It explained that “a significant amount of material including emails and documents appears to have been accessed illegally from a back-up server in CRU and downloaded in whole, or possibly in part, on to the RealClimate website.”²⁷ This incident was the subject of a police enquiry and the Norfolk Constabulary investigation was expected to take some time. UEA was keen to stress that this “episode is being treated very seriously” and announced that it had set up the independent inquiry, headed by Sir Muir Russell, to investigate the allegations against CRU. UEA said that “none of the adjusted station data referred to in the emails that have been published has been destroyed.”²⁸

13. In the light of the gravity of the allegations against CRU, the growing weight of damaging press coverage, on-going concerns about the deletion of data and the serious implications for UK science we decided to hold an inquiry into the disclosure of the data at CRU. On 22 January 2010 we therefore announced the inquiry inviting submissions on three key issues:

- What were the implications of the disclosures for the integrity of scientific research?
- Were the terms of reference and scope of the Independent Review announced on 3 December 2009 by UEA adequate?

25 “CRU Scientific Assessment Panel announced”, UEA Press Release, 22 March 2010, www.uea.ac.uk/mac/comm/media/press/CRUstatements/SAPannounce

26 House of Commons Science and Technology Committee Press Notice 04, 7 December 2009, Session 2009–10

27 Ev 16

28 Ev 17

- How independent were the other two international data sets (see paragraph 23)?

14. If there had been more time available before the end of this Parliament we would have preferred to carry out a wider inquiry into the science of global warming itself. In response to enquiries we issued a statement on 1 February making it clear that the inquiry would focus on the terms of reference announced on 22 January and that this was not an inquiry into global warming.²⁹

15. We set a deadline of 10 February for the submission of memoranda and we have received 58 submissions, not including supplementary memoranda. We held one oral evidence session on 1 March, when we took evidence from five panels:

- a) Rt Hon Lord Lawson of Blaby, Chairman, and Dr Benny Peiser, Director, Global Warming Policy Foundation;
- b) Richard Thomas CBE, former Information Commissioner;
- c) Professor Edward Acton, Vice-Chancellor, UEA and Professor Phil Jones, Director of CRU;
- d) Sir Muir Russell, Head of the Independent Climate Change E-Mails Review; and
- e) Professor John Beddington, Government Chief Scientific Adviser, Professor Julia Slingo OBE, Chief Scientist, Met Office, and Professor Bob Watson, Chief Scientist, Department for Environment, Food and Rural Affairs.

16. We would like to thank everyone who contributed to the inquiry through written submissions or oral evidence. We also received unsolicited copies of a number of books challenging anthropogenic global warming and reviewing events at CRU and the disclosed e-mails.³⁰

Our Report

17. In the time left before the end of this Parliament we will not be able to cover all the issues raised by the events at UEA, nor cover all the ground that would be covered by the Independent Climate Change Email Review and the Scientific Appraisal Panel. We have therefore concentrated on what we believe to be key issues. Of central concern is the accuracy and availability of CRU's data, datasets and computer programming, which we address in Chapter 2 of this Report; and related to the data and methodology is the question of access, or the withholding of access, under the Freedom of Information Act 2000 which we cover in Chapter 3. Finally, in Chapter 4 we comment on the independent reviews that UEA has announced.

29 House of Commons Science and Technology Committee Press Notice 11, 1 February 2010, Session 2009–10

30 The Committee received the following books:
Christopher Booker, *The Real Global Warming Disaster*, Continuum, 2009
A.W. Montford, *The Hockey Stick Illusion*, Stacey International, 2010
Steven Mosher and Tom Fuller, *Climategate*, St Matthew Publishing, 2010
Ian Plimer, *Heaven and Earth*, Quartet Books Limited, 2009

2 Datasets

Climate science

18. *Climate* is distinct from *weather*: it is the average of weather conditions over a number of years. Climatologists study climates in different parts of the world and for the Earth as a whole. CRU, according to its website: “has developed a number of the data sets widely used in climate research, including the global temperature record used to monitor the state of the climate system, as well as statistical software packages and climate models”.³¹

19. The process of calculating the Earth’s average global temperatures (past, present and future) is complicated and lengthy. Data from thousands of weather stations all around the world, on land and at sea, must be collected, checked for quality, adjusted for inconsistencies and error margins, and then mapped onto a series of grids on the Earth’s surface. The methods, results and conclusions are then presented to the academic world, first by passing the peer review process prior to publication, and second, after presentation, the scrutiny of the wider academic community.

20. Climate science, like any other science, uses the scientific method to make its assessments of past and present climate and predictions about the future climate. The key characteristics of the scientific method can be described as: characterisations, hypotheses, predictions, and experiments.

- Characterisations: consideration of a problem, and examination of whether or not an explanation exists for it.
- Hypotheses: if no such explanation exists, a new explanation is stated.
- Predictions: what consequences follow from a new explanation?
- Experiments: is the outcome consistent with the predicted consequences?

Each of these is subject to peer review prior to the formal sharing of knowledge through publication. Through peer review scientists allow their views and methods to be critically appraised expertly and externally.

- Replication and verification

To have the results and conclusions survive criticism or scepticism and be part of the accepted canon of scientific knowledge, most experiments will have to be demonstrably replicable (by the same group) to pass peer review and will often need to be verified by other independent researchers taking similar approaches.

21. Therefore climatologists are, like other scientists, required to test their theories—such as global warming and the causes of warming—against observational data. They must also replicate and verify their experiments, by holding independent datasets and conducting independent analyses of these datasets, and by publishing their full methods and results for

scrutiny. Ultimately, these ideas are put up to the threat of falsification by other scientists working in the field.

22. In this Chapter we discuss some aspects of this process.

Context

23. There are three main international climate datasets, which have been built up from direct temperature measurements on land and sea at weather stations all around the world:

- a) the National Climatic Data Center (NCDC) of the National Oceanographic and Atmospheric Administration (NOAA) in Asheville, North Carolina, USA;
- b) the Goddard Institute of Space Studies (GISS), part of the National Aeronautic and Space Administration (NASA) in New York, USA; and
- c) CRUTEM3, at CRU, UEA.³²

24. In addition, there are two others, one in Russia and one in Japan, that use similar methods.³³ There are also two that use satellite observations, by the University of Alabama at Huntsville and by Remote Sensing Systems, California.³⁴

25. Professor Jones, commenting on the different climate research groups around the world in the UK, US, Russia and Japan,³⁵ told us that:

we are all working independently so we may be using a lot of common data but the way of going from the raw data to a derived product of gridded temperatures and then the average for the hemisphere and the globe is totally independent between the different groups.³⁶

26. What sets the CRU dataset apart is its comprehensiveness:

The CRU dataset, which forms the land surface component of the HadCRUT global temperature record, was compiled with the aim of comprehensiveness. The majority of the data in it are derived from the same freely-available raw data sets used by NOAA and NASA. However, it also includes data derived from station data that were obtained directly from countries, institutions and scientists on the understanding that they would not be passed on.³⁷

Complaints and accusations

27. The complaints and accusations made against CRU in relation to the scientific process come under two broad headings. The first is transparency: that CRU failed to abide by best

³² Ev 21, para 4.2

³³ Q 78

³⁴ Ev 104 [D.R. Keiller], para 2

³⁵ Q 79

³⁶ Q 80

³⁷ Ev 64 [John Beddington and Julia Slingo]

scientific practice by refusing to share its raw data and detailed methods. The second is honesty: that CRU has deliberately misrepresented the data, in order to produce results that fit its preconceived views about the anthropogenic warming of the climate. We take each of these complaints and accusations in turn.

Transparency

Raw data

28. Warwick Hughes, a “freelance earth scientist from Australia”,³⁸ had asked Professor Jones for CRU’s raw data. He received the following reply:

I should warn you that some data we have we are not supposed [to] pass on to others. We can pass on the gridded data—which we do. Even if WMO [World Meteorological Organization] agrees, I will still not pass on the data. We have 25 or so years invested in the work. Why should I make the data available to you, when your aim is to try and find something wrong with it.³⁹

29. On the face of it, this looks like an unreasonable response to a reasonable request. As Lord Lawson put it: “Ask any decent scientist and they will say the keystone for integrity in scientific research is full and transparent disclosure of data and methods”.⁴⁰ However, Professor Jones, while confessing that he has sent some “awful” e-mails,⁴¹ defended his position.

30. First, in answer to the question of whether the raw data are accessible and verifiable, Professor Jones told us that:

The simple answer is yes, most of the same basic data are available in the United States in something called the Global Historical Climatology Network. They have been downloadable there for a number of years so people have been able to take the data, do whatever method of assessment of the quality of the data and derive their own gridded product and compare that with other workers.⁴²

31. In addition, of course, there are the sources of the data, the weather stations, to which any individual is free to go and collect the data in the same way that CRU did. This is feasible because the list of stations that CRU used was published in 2008.⁴³

32. Even if CRU had wanted to, it would have been unable to publish all of these data because, as Professor Acton explained, some of the data are bound by commercial agreements with different national meteorological organisations:

38 www.warwickhughes.com

39 Ev 158, Appendix 1

40 Q 9

41 Q 103

42 Q 78

43 Q 98

Unfortunately, several of these countries impose conditions and say you are not allowed to pass [on the data]. Seven countries have said “No, you cannot”, half the countries have not yet answered, Canada and Poland are amongst those who have said, “No you cannot publish it” and also Sweden. Russia is very hesitant. We are under a commercial promise, as it were, not to; we are longing to publish it because what science needs is the most openness.⁴⁴

(The issue with Sweden has since been resolved. The Swedish Meteorological and Hydrological Institute gave permission for CRU to publish its Swedish data on the UEA website on 8 March 2010.⁴⁵)

33. Second, as UEA explained in its submission, it is:

sometimes necessary to adjust temperature data because changes in station location, instrument or observation time, or in the methods used to calculate monthly average temperatures can introduce false trends. These have to be removed or adjusted, or else the overall series of values will be incorrect. In the early 1980s, CRU painstakingly examined the long-term homogeneity of each station temperature series which it acquired. As a result, data were adjusted for about 11% of the sites, that is approximately 314 sites out of a then-total of some 3,276. This was in complete accordance with standard practice, and all adjustments were documented.⁴⁶

34. Professor Jones added, when he gave oral evidence:

It is all documented [...] what [adjustments we made to the data] in the 1980s and since then we have obviously added more station data as more has become available, as countries have digitised more data; we have added that in and we have reported on that in our peer review publications in 2003 and 2006.⁴⁷

35. These kinds of adjustments to raw data take a lot of time. That is why, in the words of Professor Jones, “Most scientists do not want to deal with the raw station data, they would rather deal with a derived product”.⁴⁸

36. A third point was made by Professor Acton that CRU should not be under any obligation to provide raw data:

May I also point out that it is not a national archive, it is not a library, it is a research unit. It has no special duty to conserve and its data is the copy of data provided by over 150 countries, whose national meteorological stations turn the data into the average for a month.⁴⁹

44 Q 94

45 Ev 39, para B

46 Ev 18, para 3.4

47 Q 81

48 Q 107

49 Q 92

37. CRU's refusal to release the raw data gave some the impression that it was deliberately keeping its work private so that its studies could not "be replicated and critiqued".⁵⁰ The Peabody Energy Company said of CRU that "they appeared to be particularly concerned that putting their information in the public domain would expose their work to criticism".⁵¹ Even an effort to conduct a simple quality check was said to be thwarted by CRU's unwillingness to share the data it had used.⁵² In contrast, NASA has been able to make all its raw data available as well as its programmes.⁵³

38. We recognise that some of the e-mails suggest a blunt refusal to share data, even unrestricted data, with others. We acknowledge that Professor Jones must have found it frustrating to handle requests for data that he knew—or perceived—were motivated by a desire simply to seek to undermine his work. But Professor Jones's failure to handle helpfully requests for data in a field as important and controversial as climate science was bound to be viewed with suspicion. He was obviously frustrated by other workers in the field trying to "undermine" his work, but his actions were inevitably counterproductive. Professor Jones told us that the published e-mails represented only "one tenth of 1%" of his output, which amounts to one million e-mails, and that we were only seeing the end of a protracted series of e-mail exchanges. We consider that further suspicion could have been allayed by releasing all the e-mails. In addition, we consider that had the available raw data been available online from an early stage, these kinds of unfortunate e-mail exchanges would not have occurred. In our view, CRU should have been more open with its raw data and followed the more open approach of NASA to making data available.

39. We are not in a position to set out any further the extent, if any, to which CRU should have made the data available in the interests of transparency, and we hope that the Independent Climate Change Email Review will reach specific conclusions on this point. However, transparency and accountability are of increasing importance to the public, so we recommend that the Government reviews the rules for the accessibility of data sets collected and analysed with UK public money.

Methods

40. The Royal Society of Chemistry in its submission made it clear that:

It is essential that the public and all non-specialists remain truly confident in the scientific method to provide a sound scientific evidence-base on which strong decisions can be made.⁵⁴

There have been criticisms that Professor Jones and colleagues have not shared their methodologies. Andrew Montford, author of *The Hockey Stick Illusion*,⁵⁵ pointed out in his memorandum that:

⁵⁰ Ev 194 [Peabody Energy Company], para 20

⁵¹ *As above*

⁵² Ev 152 [Steven Mosher], para 8

⁵³ Q 150 [Professor Jones]

⁵⁴ Ev 170, summary

The scientific method demands that findings be subject to testing and verification by others. The refusal of CRU scientists to release information to those who they felt might question or threaten their findings have led many to conclude that the CRU's work is not trustworthy.⁵⁶

41. Professor Jones contested these claims. According to him, "The methods are published in the scientific papers; they are relatively simple and there is nothing that is rocket science in them".⁵⁷ He also noted: "We have made all the adjustments we have made to the data available in these reports⁵⁸; they are 25 years old now".⁵⁹ He added that the programme that produced the global temperature average had been available from the Met Office since December 2009.⁶⁰

42. On this basis, he argued, it was unnecessary to provide the exact codes that he used to produce the CRUTEM3 chart. The Met Office had released its code and it produced exactly the same result.⁶¹

43. In answer to the charge that the computer codes that were stolen from CRU's computer network were defective,⁶² Professor Jones pointed out that:

Those codes are from a much earlier time, they are from the period about 2000 to 2004. [They] do not relate to the production of the global and hemispheric temperature series. They are nothing to do with that, they are to do with a different project [...] that was funded by the British Atmospheric Data Centre, which is run by NERC, and that was to produce more gridded temperature data and precipitation data and other variables. A lot of that has been released on a Dutch website and also the BADC website.⁶³

44. CRU's alleged refusal to disclose its assumptions and methodologies gave credence to the view that exposure to "independent scrutiny would have undermined the AGW [anthropogenic global warming] hypothesis".⁶⁴ However, the failure to publish the computer code for CRUTEM3 left CRU vulnerable when concerns emerged that other codes it used had faults. John Graham-Cumming, a professional computer programmer, told us that:

55 Andrew Montford, *The Hockey Stick Illusion: Climategate and the corruption of science*, Stacey International, 2010

56 Ev 159, para 4

57 Q 92

58 Raymond Bradley, Mick Kelly, Phil Jones and others, *A Climatic Data Bank for Northern Hemisphere Land Areas, 1851-1980*, US DoE, Technical Report TRO17, 1985, p 335; Phil Jones, Sarah Raper, Ben Santer, and others, *A Grid Point Surface Air Temperature Data Set for the Northern Hemisphere*, DoE Technical Report No. TR022, US Department of Energy, 1985, p 251; Phil Jones, Sarah Raper, Claire Goodess, and others, *A Grid Point Surface Air Temperature Data Set for the Southern Hemisphere, 1851-1984*, DoE Technical Report No. TR027, US Department of Energy, 1986, 73

59 Q 97

60 As above

61 Qq 139-42

62 Ev 32, Q 137; Ev 196 [John Graham-Cumming]

63 Qq 137-38

64 Ev 94 [Clive Menzies], para 1.5

the organization writing the [other] code did not adhere to standards one might find in professional software engineering. The code had easily identified bugs, no visible test mechanism, was not apparently under version control and was poorly documented. It would not be surprising to find that other code written at the same organization was of similar quality. And given that I subsequently found a bug in the actual CRUTEM3 code only reinforces my opinion.⁶⁵

45. The conspiracy claims were fuelled by CRU's refusal to share the most detailed aspects of its methodologies, for example, the computer codes for producing global temperature averages. **We note that the research passed the peer review process of some highly reputable journals. However, we note that CRU could have been more open at that time in providing the detailed methodological working on its website. We recommend that all publicly funded research groups consider whether they are being as open as they can be, and ought to be, with the details of their methodologies.**

Repeatability and verification

46. These complaints and concerns surrounding transparency cut to the heart of the scientific process. It has been argued that without access to the raw data and detailed methodology it is not possible to check the results of CRU's work. The Institute of Physics pointed out that:

Published reconstructions may represent only a part of the raw data available and may be sensitive to the choices made and the statistical techniques used. Different choices, omissions or statistical processes may lead to different conclusions. This possibility was evidently the reason behind some of the (rejected) requests for further information.⁶⁶

47. This has substance if one considers CRU's work in isolation. But science is more than individual researchers or research groups. One should put research in context and ask the question: what would one hope to find by double checking the processing of the raw data? If this were the only dataset in existence, and Professor Jones's team had been the only team in the world to analyse it, then it might make sense to double check independently the processing of the raw data and the methods. But there are other datasets and other analyses that have been carried out as Professor Jones explained:

There are two groups in America that we [CRU] compare with and there are also two additional groups, one in Russia and one in Japan, that also produce similar records to ourselves and they all show pretty much the same sort of course of instrumental temperature change since the nineteenth century compared to today.⁶⁷

[...] we are all working independently so we may be using a lot of common data but the way of going from the raw data to a derived product of gridded temperatures and

65 Ev 196

66 Ev 167, para 4

67 Q 78

then the average for the hemisphere and the globe is totally independent between the different groups.⁶⁸

48. In its memorandum UEA explained the differences between the methodologies used by three basic datasets for land areas of the world, NOAA, NASA and CRU/UEA:

All these datasets rely on primary observations recorded by NMSs [National Meteorological Services] across the globe.⁶⁹

GISS^[70] and NCDC^[71] each use at least 7,200 stations. CRUTEM3 uses fewer. In CRUTEM3, each monthly temperature value is expressed as a departure from the average for the base period 1961–90. This “anomaly method” of expressing temperature records demands an adequate amount of data for the base period; this limitation reduces the number of stations used by CRUTEM3 to 4,348 (from the dataset total of 5,121). The latest NCDC analysis [...] has now moved to the “anomaly method” though with different refinements from those of CRU.⁷²

NCDC and GISS use different approaches to the problem of “absolute temperature” from those of CRUTEM3. The homogeneity procedures undertaken by GISS and NCDC are completely different from those adopted for CRUTEM3. NCDC has an automated adjustment procedure [...], whilst GISS additionally makes allowances for urbanization effects at some stations.⁷³

49. In our call for evidence we asked for submissions on the question of how independent the other international data sets are. We have established to the extent that a limited inquiry of this nature can, that the NCDC/NOAA and GISS/NASA data sets measuring temperature changes on land and at sea have arrived at similar conclusions using similar data to that used by CRU, but using independently devised methodologies. We have further identified that there are two other data sets (University of Alabama and Remote Sensing Systems), using satellite observations that use entirely different data than that used by CRU. These also confirm the findings of the CRU work. **We therefore conclude that there is independent verification, through the use of other methodologies and other sources of data, of the results and conclusions of the Climate Research Unit at the University of East Anglia.**

50. The fact that all the datasets show broadly the same sort of course of instrumental temperature change since the nineteenth century compared to today was why Professor John Beddington, the Government Chief Scientific Adviser, had the confidence to say that

68 Q 80

69 Ev 21, para 4.3

70 Dataset held by the Goddard Institute for Space Studies (GISS, USA) part of the National Aeronautic and Space Administration (NASA)

71 Global Historical Climatology Network (GHCN) dataset held by National Climatic Data Center (NCDC), the National Oceanographic and Atmospheric Administration (NOAA, USA)

72 Ev 21, para 4.4

73 Ev 21, para 4.5

human induced global warming was, in terms of the evidence to support that hypothesis, “unchallengeable”.⁷⁴

I think in terms of datasets, of the way in which data is analysed, there will always be some degree of uncertainty but when you get a series of fundamentally different analyses on the basic data and they come up with similar conclusions, you get a [...] great deal of certainty coming out of it.⁷⁵

51. Even if the data that CRU used were not publicly available—which they mostly are—or the methods not published—which they have been—its published results would still be credible: the results from CRU agree with those drawn from other international data sets; in other words, the analyses have been repeated and the conclusions have been verified.

52. That is probably part of why it has not been practice in the climate science community to publish all the data and computer codes with the academic papers. We got to the crux of the issue during an interesting exchange with Professor Jones:

Graham Stringer: You are saying that every paper that you have produced, the computer programmes, the weather stations, all the information, the codes, have been available to scientists so that they could test out how good your work was. Is that the case on all the papers you have produced?

Professor Jones: That is not the case.

Graham Stringer: Why is it not?

Professor Jones: Because it has not been standard practice to do that.

Graham Stringer: That takes me back to the original point, that if it is not standard practice how can the science progress?

Professor Jones: Maybe it should be standard practice but it is not standard practice across the subject.⁷⁶

53. Another reason why data and the codes were not published may be that norms for publication evolved in a period when the journals were only published in hard copy. In such circumstances it is understandable why an editor would not want to publish raw climate data (extremely long lists of numbers) and code for the computer programmes that analyse the data (which run to hundreds of thousands of lines of code). However, in the age of the internet, these kinds of products can be made available more easily, and we are minded to agree with Professor Jones observation on this point that: “Maybe it should be standard practice”.⁷⁷

74 Q 191

75 Qq 191–92

76 Qq 100–02

77 Q 102

54. It is not standard practice in climate science and many other fields to publish the raw data and the computer code in academic papers. We think that this is problematic because climate science is a matter of global importance and of public interest, and therefore the quality and transparency of the science should be irreproachable. We therefore consider that climate scientists should take steps to make available all the data used to generate their published work, including raw data; and it should also be made clear and referenced where data has been used but, because of commercial or national security reasons is not available. Scientists are also, under Freedom of Information laws and under the rules of normal scientific conduct, entitled to withhold data which is due to be published under the peer-review process.⁷⁸ In addition, scientists should take steps to make available in full their methodological workings, including the computer codes. Data and methodological workings should be provided via the internet. There should be enough information published to allow verification.

Dishonesty

55. Of all the e-mails released, one dated 16 November 1999 has caused particular concern:

I've just completed Mike's Nature trick of adding in the real temps to each series for the last 20 years (ie from 1981 onwards) and [sic] from 1961 for Keith's to hide the decline.⁷⁹

56. The word "trick" and the phrase "hide the decline" have been taken by some to demonstrate intent on the part of Professor Jones to "falsify data" and to "exaggerate warming".⁸⁰

"Trick"

57. In his submission, Peter Taylor, author of *Chill*,⁸¹ states that:

The tree ring data did not match the model expectation (ie the 'hockey stick' pattern of a sudden rise at the end of the period). Rather than admit this, the team-workers discuss using Michael Mann's 'trick' of replacing the offending tree-ring data and using instrumental data in its place in a spliced graph.⁸²

58. UEA interpreted the use of the word "trick" differently:

as for the (now notorious) word 'trick', so deeply appealing to the media, this has been richly misinterpreted and quoted out of context. It was used in an informal email, discussing the difficulties of statistical presentation. It does not mean a 'ruse' or method of deception. In context it is obvious that it is used in the informal sense

78 See paragraph 78 and following; section 22 of the FOIA provides an exemption from disclosure where the requested information is intended for future (but imminent) publication.

79 E-mail from Phil Jones to Ray Bradley, 16 November 1999

80 Ev 93 [Godfrey Bloom MEP], para 4

81 Peter Taylor, *Chill, A Reassessment of Global Warming Theory: Does Climate Change Mean the World is Cooling, and If So What Should We Do About It?*, Clairview Books, 2009

82 Ev 188, para 22

of 'the best way of doing something'. In this case it was 'the trick or knack' of constructing a statistical illustration which would combine the most reliable proxy and instrumental evidence of temperature trends.⁸³

59. These interpretations of the colloquial meaning of "trick" have been accepted by even the staunchest of critics:

Lord Lawson of Blaby: The sinister thing is not the word 'trick'. In their [UEA's] own evidence they say that what they mean by 'trick' is the best way of doing something.

Chairman: You accept that?

Lord Lawson of Blaby: I accept that.⁸⁴

60. Critics of CRU have suggested that Professor Jones's use of the word "trick" is evidence that he was part of a conspiracy to hide evidence that did not fit his view that recent global warming is predominately caused by human activity. The balance of evidence patently fails to support this view. It appears to be a colloquialism for a "neat" method of handling data.

"Hide the decline"

61. Lord Lawson did, however, describe CRU's treatment of the data as "reprehensible",⁸⁵ because, in his view, Professor Jones deliberately hid data that demonstrated a decline in temperatures.⁸⁶

62. The data that he believed to be "hidden" are a set of tree ring data that disagree with other data sources regarding temperature trends. Lord Lawson said: "when the proxy series [...] departed from the measured temperature series, a normal person will say maybe that means the proxy series is not all that reliable".⁸⁷ In that context he made two specific claims:

- that the tree ring data were flawed because "for a long period before 1421 they relied on one single pine tree";⁸⁸ and
- that the divergence problem was not just for data after the 1960s, "it is not a good fit in the latter half of the nineteenth century either".⁸⁹

63. It is outside the remit of the terms of reference of this inquiry to make a detailed assessment of the science, but it is worth noting that Professor Jones had a very different perspective. On the first point, he commented:

⁸³ Ev 19, para 3.5.6

⁸⁴ Qq 25-26

⁸⁵ Q 26

⁸⁶ Qq 26-28

⁸⁷ Q 26

⁸⁸ As above

⁸⁹ Q 28

That particular reconstruction went back to 1400, or just after 1400, and that is because there are insufficient trees to go back before that, there are more than just one. We have criteria to determine how far you can go back in terms of the number of trees you have at a certain number of sites.⁹⁰

64. On the second point, he told us:

One of the curves was based on tree ring data which showed a very good relationship between the tree rings and the temperature from the latter part of the nineteenth century through to 1960, and after that there was a divergence where the trees did not go up as much as the real temperatures had.⁹¹

65. Professor Jones has published on this issue on several occasions, including a 1998 *Nature* paper⁹² and subsequent papers.⁹³ He contested the view that he was trying to hide the decline in the sense that he was trying to pretend that these data did not exist and thereby exaggerate global warming: “We do not accept it was hidden because it was discussed in a paper^[94] the year before and we have discussed it in every paper we have written on tree rings and climate”.⁹⁵ Rather, what was meant by “hide the decline” was remove the effects of data known to be problematic in the sense that the data were known to be misleading. UEA made it clear in its written submission that:

CRU never sought to disguise this specific type of tree-ring “decline or divergence”. On the contrary, CRU has published a number of pioneering articles that illustrate, suggest reasons for, and discuss the implications of this interesting phenomenon.⁹⁶

66. Critics of CRU have suggested that Professor Jones’s use of the words “hide the decline” is evidence that he was part of a conspiracy to hide evidence that did not fit his view that recent global warming is predominantly caused by human activity. That he has published papers—including a paper in *Nature*—dealing with this aspect of the science clearly refutes this allegation. In our view, it was shorthand for the practice of discarding data known to be erroneous. We expect that this is a matter the Scientific Appraisal Panel will address.

Perverting the peer review process

67. The main allegations on the suppression or distortion of others’ findings concern the role of CRU in the operation of the peer review process. It has been alleged that scientists at CRU abused the peer review process to prevent those with dissenting views on climate change the opportunity in getting papers published. There are three key accusations. First,

90 Q 125

91 Q 122

92 Q 122; Keith Briffa and others, “Reduced sensitivity of recent tree-growth to temperature at high northern latitudes”, *Nature*, vol 391 (1998), pp 678-82

93 For example: Edward Cook, Paul Krusic and Phil Jones, “Dendroclimatic signals in long tree-ring chronologies from the Himalayas of Nepal”, *International Journal of Climatology*, Vol 23 (2003), pp 707-32

94 Keith Briffa and others, “Trees tell of past climates: but are they speaking less clearly today?”, *Philosophical Transactions of the Royal Society of London Series B-Biological Sciences*, vol 353 (1998), pp 65-73

95 Q 124

96 Ev 19, para 3.5.5

David Holland, an author of several FOIA requests that were mentioned in the leaked e-mails, claimed that climate scientists at CRU corrupted the IPCC process:

The emails show that a group of influential climate scientists colluded to subvert the peer-review process of the IPCC and science journals, and thereby delay or prevent the publication and assessment of research by scientists who disagreed with the group's conclusions about global warming. They manufactured pre-determined conclusions through the corruption of the IPCC process and deleted procedural and other information hoping to avoid its disclosure under freedom-of-information requests.⁹⁷

68. In one e-mail, Professor Jones appeared to suggest that he and another scientist would deliberately try to "keep out" two papers from the IPCC's Fourth Assessment Report.⁹⁸

From: Phil Jones <p.jones@xxxxxxxxxx.xxx>
To: "Michael E. Mann" <mann@xxxxxxxxxx.xxx>
Subject: HIGHLY CONFIDENTIAL
Date: Thu Jul 8 16:30:16 2004

Mike,

Only have it in the pdf form. FYI ONLY - don't pass on. Relevant paras are the last

2 in section 4 on p13. As I said it is worded carefully due to Adrian knowing Eugenia for years. He knows they're wrong, but he succumbed to her almost pleading with him to tone it down as it might affect her proposals in the future !

I didn't say any of this, so be careful how you use it - if at all. Keep quiet also that you have the pdf. The attachment is a very good paper - I've been pushing Adrian over the last weeks to get it submitted to JGR or J. Climate. The main results are great for CRU and also for ERA-40. The basic message is clear - you have to put enough surface and sonde obs into a model to produce Reanalyses. The jumps when the data input change stand out so clearly. NCEP does many odd things also around sea ice and over snow and ice. The other paper by MM is just garbage - as you knew. De Freitas again. Pielke is also losing all credibility as well by replying to the mad Finn as well - frequently as I see it. I can't see either of these papers being in the next IPCC report. Kevin and I will keep them out somehow - even if we have to redefine what the peer-review literature is !

69. The second is that climate scientists tried to suppress a paper on research fraud. As Dr Benny Peiser, Director of the Global Warming Policy Foundation, put it:

The CRU e-mails under investigation suggest that climate scientists (not only at CRU but also elsewhere) have actively sought to prevent a paper on alleged research fraud from being published in violation of principles of academic integrity.⁹⁹

70. The third allegation is made by Dr Sonja Boehmer-Christiansen, a former peer reviewer for the IPCC, editor of the journal, *Energy & Environment*, and Reader Emeritus

97 Ev 115, para 2

98 www.eastangliaemails.com

99 Ev 164, para 2

at Hull University, who stated in her memorandum that her journal became the focus of attacks from CRU scientists:

As editor of a journal which remained open to scientists who challenged the orthodoxy, I became the target of a number of CRU manoeuvres. The hacked emails revealed attempts to manipulate peer review to E&E's disadvantage, and showed that libel threats were considered against its editorial team. Dr Jones even tried to put pressure on my university department. The emailers expressed anger over my publication of several papers that questioned the 'hockey stick' graph and the reliability of CRU temperature data. The desire to control the peer review process in their favour is expressed several times. [...] CRU clearly disliked my journal and believed that "good" climate scientists do not read it.¹⁰⁰

71. When we asked Professor Jones about these accusations, he contested each of them.

- On the claim that he tried to keep two papers out of the IPCC report, he explained that the papers were already published and that "I was just commenting that I did not think those papers were very good".¹⁰¹
- On the claim by he tried to suppress papers that alleged research fraud, he told us:

Dr Benny Peiser [...] was editing a series of papers in *Energy & Environment*. He asked me to comment on a particular paper and I sent him some views back that I did not think the paper was very good. It was not a formal review, he was just asking me for my views.¹⁰²

- On the claims made by Dr Boehmer-Christiansen, he noted: "I was sending an email to the head of department about a complaint that she had made about me to the UK Climate Impacts Programme, so I was just responding there".¹⁰³

72. In summary, Professor Jones argued:

I do not think there is anything in those emails that really supports any view that I or CRU have been trying to pervert the peer review process in any way. I have just been giving my views on specific papers.¹⁰⁴

73. The evidence that we have seen does not suggest that Professor Jones was trying to subvert the peer review process. Academics should not be criticised for making informal comments on academic papers. The Independent Climate Change Email Review should look in detail at all of these claims.

100 Ev 125, paras 4.1–4.3

101 Q 154

102 Q 157

103 As above

104 Q 159

3 Freedom of information issues

74. We are not a tribunal reviewing whether breaches of the Freedom of Information Act 2000 (FOIA) have taken place but see as our role in this inquiry as considering whether:

- (a) the arrangements for examining whether CRU breached FOIA are adequate;
- (b) whether the six-month time limit on the initiation of a prosecution where a public authority acts so as to prevent intentionally the disclosure of requested information needs to be revised; and
- (c) whether UEA ensured that CRU was able to meet the requirements of the legislation when it received FOIA requests.

Freedom of Information legislation

75. The FOIA creating new rights of access to information came into operation on 1 January 2005. CRU, as part of UEA, is classed as a “public authority” for the purposes of the FOIA. In his submission Richard Thomas, who was Information Commissioner from 2002 until June 2009, explained the application of the FOIA to scientific data held by UK universities:

the public must be satisfied that publicly-funded universities, as with any other public authority in receipt of public funding, are properly accountable, adopt systems of good governance and can inspire public trust and confidence in their work and operations [...] The fact that the FOIA requests relate to complex scientific data does not detract from this proposition or excuse non-compliance.¹⁰⁵

76. When he gave oral evidence, we asked Mr Thomas if the legislation drew a distinction between, on the one hand, scientific data and modelling and, on the other hand, administrative records. He replied:

the broad answer [...] is no [...] First of all, the legislation applies to information held by the public authority, and information is not elaborated in that sense. [...] It is not ownership. The legislation uses the word “held”, and in the Environmental Information Regulations [EIR] that phrase “held” is slightly elaborated. If I can quote the regulation for you there, “It is held by a public authority if the information: (a) is in the authority’s possession and has been produced or received by the authority, or (b) is held by another person on behalf of the authority.” So that is an elaboration of the concept of “held”. It is not ownership.¹⁰⁶

77. Mr Thomas considered that the issues in this case which were most relevant to the information law appeared to be:

- (a) the relevance and impact of the information laws on scientific and academic research conducted within universities;

¹⁰⁵ Ev 8, para 3.2

¹⁰⁶ Qq 59–60

- (b) the adequacy of section 77 of FOIA to deal with suggestions that CRU researchers deleted information, not in the course of normal work, but to frustrate FOIA/EIR¹⁰⁷ requests;
- (c) the handling of a large number of FOIA/EIR requests by UEA relating especially to climate change research which (within CRU) it “held”; and
- (d) whether this case illustrates that there is scope to extend the “proactive” disclosure provisions of FOIA as they relate to universities.¹⁰⁸

78. Parliament has created a presumption in favour of disclosure but there are exclusions.¹⁰⁹ Mr Thomas explained:

There are over 20 exemptions to the fundamental duty to disclose requested information in FOIA.[...] Eight of the main exemptions are absolute and 16 are qualified. Qualified means that there is a “public interest override,” which means that, even where the exemption applies, the public interest considerations must be considered. In formal terms, there must still be disclosure—even though the qualified exemption applies—unless the public interest in the exemption outweighs the public interest in disclosure.

Mr Thomas added that:

The exemptions are similar to those found in other Freedom of Information laws in force in the world. I am not aware which exemptions were considered by the University as potentially applicable to some or all of the requests to CRU. I can speculate that some or all of the following [...] might have been considered:

- (a) Section 22—where the requested information is intended for future (but imminent) publication;
- (b) Section 40—where disclosure of personal data would breach any of the data protection principles;
- (c) Section 41—where the information had been obtained from elsewhere in such circumstances that its disclosure would constitute an actionable breach of confidence under common law;
- (d) Section 43 (qualified)—where disclosure would, or would be likely to, prejudice the commercial interests of any person, including the public authority;
- (e) Section 44—where disclosure is prohibited by another enactment or inconsistent with an EU obligation (which may include some intellectual property restrictions); and

¹⁰⁷ EIR: Environmental Information Regulations 2004. Deriving from European Directive 2003/4/EC these give rights of public access to environmental information held by public authorities.

¹⁰⁸ Ev 8, para 2.2

¹⁰⁹ Ev 9, para 3.6

- (f) Section 14 (not an exemption, strictly speaking)—where the request is vexatious.¹¹⁰

79. We were grateful to Mr Thomas for explaining the operation of the FOIA and EIR. He did, however, point out that he did not have detailed knowledge of events at UEA since leaving the Information Commissioner's Office:

I have no idea at all what has happened inside my former office. I cannot say because this is a serious matter. It depends a great deal on the circumstances of the particular case, the evidence. I have had no direct contact with the office as to how this case is being handled.¹¹¹

Alleged breaches of the Freedom of Information Act 2000

The e-mails

80. Some of the hacked e-mails appear to reveal scientists encouraging their colleagues to resist disclosure and to delete e-mails, apparently to prevent them from being revealed to people making FOIA requests. Below are examples, in chronological order, of e-mails sent by Professor Jones which address FOIA and requests for information.

E-mail: 1107454306 [Extract]

At 09:41 AM 2/2/2005, Phil Jones wrote:

Mike,[...]Just sent loads of station data to Scott. Make sure he documents everything better this time! And don't leave stuff lying around on ftp sites - you never know who is trawling them. The two MMs have been after the CRU station data for years. If they ever hear there is a Freedom of Information Act now in the UK, I think I'll delete the file rather than send to anyone. Does your similar act in the US force you to respond to enquiries within 20 days? - our does ! The UK works on precedents, so the first request will test it. We also have a data protection act, which I will hide behind. Tom Wigley has sent me a worried email when he heard about it - thought people could ask him for his model code. He has retired officially from UEA so he can hide behind that. IPR should be relevant here, but I can see me getting into an argument with someone at UEA who'll say we must adhere to it !. [...]

E-mail: 1219239172 [Extract]

From: Phil Jones <p.jones@xxxxxxxxxxx>

To: Gavin Schmidt <gschmidt@xxxxxxxxxxx>

Subject: Re: Revised version the Wengen paper

Date: Wed Aug 20 09:32:52 2008

[...] Keith/Tim still getting FOI requests as well as MOHC and Reading. All our FOI officers have been in discussions and are now using the same exceptions not to respond - advice they got from the Information Commissioner. As an aside and just between us, it seems that Brian Hoskins has withdrawn himself from the WG1 Lead nominations. It seems he doesn't want to have to deal with

¹¹⁰ Ev 9, para 3.7

¹¹¹ Q 58

this hassle.

The FOI line we're all using is this. IPCC is exempt from any countries FOI – the Sceptics have been told this. Even though we (MOHC, CRU/UEA) possibly hold relevant info the IPCC is not part our remit (mission statement, aims etc) therefore we don't have an obligation to pass it on.

Cheers

Phil

E-mail: 1228330629

From: Phil Jones <p.jones@xxxxxxxxx.xxx>

To: santer1@xxxxxxxxx.xxx, Tom Wigley <wigley@xxxxxxxxx.xxx>

Subject: Re: Schles suggestion

Date: Wed Dec 3 13:57:09 2008

Cc: mann <mann@xxxxxxxxx.xxx>, Gavin Schmidt <gschmidt@xxxxxxxxx.xxx>, Karl Taylor <taylor13@xxxxxxxxx.xxx>, peter gleckler gleckler1@xxxxxxxxx.xxx

Ben,

When the FOI requests began here, the FOI person said we had to abide by the requests. It took a couple of half hour sessions - one at a screen, to convince them otherwise showing them what CA was all about. Once they became aware of the types of people we were dealing with, everyone at UEA (in the registry and in the Environmental Sciences school - the head of school and a few others) became very supportive. I've got to know the FOI person quite well and the Chief Librarian - who deals with appeals. The VC is also aware of what is going on - at least for one of the requests, but probably doesn't know the number we're dealing with. We are in double figures.

One issue is that these requests aren't that widely known within the School. So I don't know who else at UEA may be getting them. CRU is moving up the ladder of requests at UEA though - we're way behind computing though. We're away of requests going to others in the UK - MOHC, Reading, DEFRA and Imperial College. So spelling out all the detail to the LLNL management should be the first thing you do. I hope that Dave is being supportive at PCMDI. The inadvertent email I sent last month has led to a Data Protection Act request sent by a certain Canadian, saying that the email maligned his scientific credibility with his peers!

If he pays 10 pounds (which he hasn't yet) I am supposed to go through my emails and he can get anything I've written about him. About 2 months ago I deleted loads of emails, so have very little - if anything at all. This legislation is different from the FOI - it is supposed to be used to find out why you might have a poor credit rating! In response to FOI and EIR requests, we've put up some data - mainly paleo data. Each request generally leads to more - to explain what we've put up. Every time, so far, that hasn't led to anything being added - instead just statements saying read what is in the papers and what is on the web site! Tim Osborn sent one such response (via the FOI person) earlier this week. We've never sent programs, any codes and manuals.

In the UK, the Research Assessment Exercise results will be out in 2 weeks time.

These are expensive to produce and take too much time, so from next year we'll be moving onto a metric based system. The metrics will be # and amounts of grants, papers and citations etc. I did flippantly suggest that the # of FOI requests you get should be another.

When you look at CA, they only look papers from a handful of people. They will start on another coming out in The Holocene early next year. Gavin and Mike are on this with loads of others. I've told both exactly what will appear on CA once they get access to it!

Cheers

Phil

E-mail: 1237496573 [Extract]

From: Phil Jones <p.jones@xxxxxxxxx.xxx>

To: santer1@xxxxxxxxx.xxx

Subject: Re: See the link below

Date: Thu Mar 19 17:02:53 2009

[...] CRU has had numerous FOI requests since the beginning of 2007. The Met Office, Reading, NCDC and GISS have had as well – many related to IPCC involvement. I know the world changes and the way we do things changes, but these requests and the sorts of simple mistakes, should not have an influence on the way things have been adequately dealt with for over a century.

Cheers

Phil

81. In his submission Andrew Montford stated that:

Research materials should be made available to outsiders as a requirement of the scientific method. That scientists have failed to do so is reprehensible, but the fact that they have apparently also resorted to breaches of the Freedom of Information Act in order to do so requires urgent attention from policymakers.¹¹²

82. As we explained in the previous chapter, David Holland was the author of several FOIA requests that were mentioned in the leaked e-mails. In his submission he pointed out that on 9 May [2008] in e-mail 1210367056, Professor Jones sent “my formal information request to ‘team’ members Mann, Hughes and Ammann” writing:

You can delete this attachment if you want. Keep this quiet also, but this is the person who is putting in FOI requests for all emails Keith and Tim have written and received re Ch 6 of AR4.¹¹³ We think we’ve found a way around this.¹¹⁴

83. Mr Holland also drew attention to e-mail 1212063122 dated 29 May 2008 in which Professor Jones asked Professor Mann:

Can you delete any emails you may have had with Keith re AR4? Keith will do likewise. Can you also email [Eu]Gene [Wahl] and get him to do the same? I don’t have his new email address. We will be getting Caspar [Ammann] to do likewise.¹¹⁵

Correspondence with the Deputy Information Commissioner

84. On 22 January 2010, when the Deputy Information Commissioner, Graham Smith, issued a statement which suggested that at least some of the requested information should

112 Ev 159, para 6

113 Intergovernmental Panel on Climate Change: Fourth Assessment Report

114 Ev 117, para 23

115 Ev 118, para 32

have been disclosed in the absence of applicable exemptions, it gave support to the criticisms of CRU's handling of FOIA requests. Mr Smith said:

The FOI Act makes it an offence for public authorities to act so as to prevent intentionally the disclosure of requested information. Mr Holland's FOI requests were submitted in 2007/8, but it has only recently come to light that they were not dealt with in accordance with the Act. The legislation requires action within six months of the offence taking place, so by the time the action came to light the opportunity to consider a prosecution was long gone.¹¹⁶

85. Mr Thomas commented that this was "clearly a reference to section 77 of the Act and/or the near-identical Regulation 19 of EIR".¹¹⁷ Section 77 of the FOIA provides:

1. Where:

- (a) a request for information has been made to a public authority,
- (b) under section 1 of this Act or section 7 of the Data Protection Act 1998, the applicant would have been entitled (subject to payment of any fee) to communication of any information in accordance with that section,

any person to whom this subsection applies is guilty of an offence if he alters, defaces, blocks, erases, destroys or conceals any record held by the public authority, with the intention of preventing the disclosure by that authority of all, or any part, of the information to the communication of which the applicant would have been entitled.

2. Subsection (1) applies to the public authority and to any person who is employed by, is an officer of, or is subject to the direction of, the public authority.

3. A person guilty of an offence under this section is liable on summary conviction to a fine not exceeding level 5 on the standard scale.¹¹⁸

86. Mr Thomas added that the Deputy Commissioner also appeared "to have in mind" section 127(1) of the Magistrates Court Act 1980, which provides that

a magistrates' court shall not try an information or hear a complaint unless the information was laid, or the complaint made, within 6 months from the time when the offence was committed, or the matter of complaint arose.¹¹⁹

Mr Thomas confirmed in oral evidence that

because of the interaction with the Magistrates Court Act, any prosecution must be brought within six months of the offence being committed.¹²⁰

87. In its memorandum to our inquiry, UEA defended its actions:

¹¹⁶ Ev 9, para 4.1

¹¹⁷ Ev 10

¹¹⁸ Ev 10, para 4.1

¹¹⁹ Ev 10, para 4.2

¹²⁰ Q 56

CRU has been accused of refusing to release data requested under the FOIA. There are many obstacles outside CRU's control surrounding the release of data provided by NMSs [National Meteorological Services]. Many FOIA requests made to CRU related to primary data provided by the NMSs. Some of these data are subject to formal non-publication agreements between the NMS and CRU. Other primary data had been provided to CRU on an individual-to-individual basis, with accompanying verbal agreements that they may be used within the gridded dataset, but should not be passed on to others. CRU responded to the FOIA requests for primary data by pointing out that approximately 90% of the stations in the CRU dataset are available from other sources, particularly GHCN.¹²¹

88. On 29 January there was an exchange between UEA and Mr Smith, the Deputy Commissioner. Brian Summers, the Registrar and Secretary of UEA responded forcibly to Mr Smith's 22 January press statement, which asserted that UEA had not dealt with FOIA requests "as they should have been under the legislation".¹²² He did not consider it was "acceptable that such a statement which has led to an extremely damaging commentary on the University [was] first communicated to the University by a journalist".¹²³ His letter goes on to defend UEA's actions in detail and to ask that, if the Information Commissioner's Office (ICO) cannot retract the 22 January statement, it issue a clarification regarding the alleged breaches of the FOIA. A response from the ICO was issued the same day. It did not retract the original statement but offered clarification:

1. [No] decision notice has yet been issued and no alleged breaches have yet been put to the University for comment. That matter has yet to be addressed, but it will be over coming months.
2. The fact that the elements of a section 77 offence may have been found here, but cannot be acted on because of the elapsed time, is a very serious matter. The ICO is not resiling from its position on this.
3. The ICO's position is as stated in point 2 above. The statement may be read to indicate that.¹²⁴ Under section 77, an offence may be committed by an individual, not necessarily the public authority itself.
4. Errors like this are frequently made in press reports and the ICO cannot be expected to correct them, particularly when the ICO has not itself referred to penalties or sanctions in its own statement.¹²⁵

¹²¹ Ev 20, para 3.7.2

¹²² "Scientists in stolen e-mail scandal hid climate data", *The Times*, 28 January 2010

¹²³ Registrar and Secretary to Deputy Information Commissioner - 29 January 2010, UEA website, Correspondence between University of East Anglia and the Information Commissioner's Office, www.uea.ac.uk/mac/comm/media/press/CRUstatements/ICOcorrespondence

¹²⁴ UEA had asked the Deputy Commissioner to confirm that "your statement cannot be taken to mean that there has been a demonstrable breach of Section 77, which is a breach of the FOI which can result in prosecution"; Registrar and Secretary to Deputy Information Commissioner, 29 January 2010, UEA website, Correspondence between University of East Anglia and the Information Commissioner's Office, www.uea.ac.uk/mac/comm/media/press/CRUstatements/ICOcorrespondence

¹²⁵ Deputy Information Commissioner to Registrar and Secretary - 29 January 2010, UEA website, Correspondence between University of East Anglia and the Information Commissioner's Office, www.uea.ac.uk/mac/comm/media/press/CRUstatements/ICOcorrespondence

89. UEA responded on 1 February thanking the ICO for the clarification but setting out its concerns relating to the press coverage of the ICO's original statement:

Your clarification that the press cannot infer from your statement to the Sunday Times that it has been established that the University (or indeed any individual associated with the University) has breached the terms of the Freedom of Information Act is welcome. [UEA's] reputation which has been subjected to these damaging and incorrect assertions claiming to be based on your statement and we must take some steps to put this right. We will be writing to the media which carried reports based on your statement, pointing out the inaccuracies and asking them to rectify the position.¹²⁶

90. In his oral evidence Professor Acton questioned the ICO statement of 22 January:

our principle is that *prima facie* evidence is evidence which on the face of it and without investigation suggests that there is a case to answer. To my mind if there is *prima facie* evidence; why did I set up the Muir Russell independent review? *Prima facie* evidence is not the same as, you have been found to breach. [...] If it is sub judice, if, as we had in the letter ten days ago from the ICO, the investigation has not even begun, I am puzzled how we could have been found to breach if there has been no investigation.¹²⁷

91. The ICO's most recent letter, dated 3 March, in UEA's view, "makes plain that there is no assumption by the ICO, prior to investigation, that UEA has breached the Act; and that no investigation has yet been completed."¹²⁸ The ICO's letter confirmed that the "ICO is not pursuing any investigation under section 77 of the Act. That matter is closed as far as the ICO is concerned, given the statutory time limits for action". It added that:

The ICO acknowledges your concern about the statement made and the subsequent media and blog reports. Given that the Deputy Commissioner has already been publicly associated with the matter, any Decision Notice will be reviewed and signed off by another authorised signatory.¹²⁹

We regret that the ICO made a statement to the press that went beyond that which it could substantiate and that it took over a month for the ICO properly to put the record straight. We recommend that the ICO develop procedures to ensure that its public comments are checked and that mechanisms exist to swiftly correct any mis-statements or misinterpretations of such statements.

92. The disclosed e-mails appear to show a culture of non-disclosure at CRU and instances where information (disclosable or otherwise) may have been deleted, to avoid disclosure. The Deputy Information Commissioner's letter of 29 January gives a clear indication that a

126 Registrar and Secretary to Deputy Information Commissioner - 1 February 2010, UEA website, Correspondence between University of East Anglia and the Information Commissioner's Office, www.uea.ac.uk/mac/comm/media/press/CRUstatements/ICOcorrespondence

127 Q130

128 Ev 39, para A

129 Ev 39, annex

breach of the FOIA may have occurred but that a prosecution was time-barred.¹³⁰ As, however, UEA pointed out, no investigation has been carried out.

93. It seems to us that both sides have a point. **There is *prima facie* evidence that CRU has breached the Freedom of Information Act 2000. It would, however, be premature, without a thorough investigation affording each party the opportunity to make representations, to conclude that UEA was in breach of the Act. In our view, it is unsatisfactory to leave the matter unresolved simply because of the operation of the six-month time limit on the initiation of prosecutions. Much of the reputation of CRU hangs on the issue. We conclude that the matter needs to be resolved conclusively—either by the Independent Climate Change Email Review or by the Information Commissioner.**

94. On the question of the six-month time limit on the initiation of prosecutions, Mr Thomas pressed for a revision of the law. He pointed out that apart from in the most blatant cases “it will usually be impossible for the ICO to detect an offence within 6 months of its occurrence” and thus to be able to initiate a prosecution.¹³¹ He drew attention to a recent debate in the House of Lords on a proposal to amend the time limit. In reply, in the debate the Parliamentary Under-Secretary of State at the Ministry of Justice said that:

The Freedom of Information Act 2000 came into force only in 2005, and [...] we have no evidence at present that the current six-month time limit presents a systemic problem for the Information Commissioner or any other prosecutor in taking action under Section 77. [...] We will listen to the views of the Information Commissioner and other interested parties on this point, and if there is evidence that the current legislation is causing systemic difficulties, we will look for ways to address the matter, if necessary by means of an alternative legislative vehicle in the future. However, I cannot go further than that today on behalf of the Government.¹³²

No change was made to the legislation.

95. We consider that events at CRU throw light on the operation of the Freedom of Information Act 2000 and, in particular, whether there is a need to amend the time limit on prosecutions from six months from the time the alleged offence was committed. **If the Minister was correct to assert in July 2009 that the Government had no evidence that the current six-month time limit presents a systemic problem, then it is now clear that such evidence exists. Irrespective of whether or not CRU breached the Freedom of Information Act 2000, we recommend that the Government review the operation of section 77 of the 2000 Act and the six month limit on the initiation of prosecutions provided by section 127(1) of the Magistrates Court Act 1980.**

130 UEA website, Correspondence between University of East Anglia and the Information Commissioner's Office, www.uea.ac.uk/mac/comm/media/press/CRUstatements/ICOcorrespondence

131 Ev 10, para 4.3

132 HL Deb, 21 July 2009, col 1571

Volume of requests

96. In the face of allegations of poor handling of FOIA requests, one of the explanations offered by UEA was that in:

July 2009 UEA received an unprecedented, and frankly administratively overwhelming, deluge of FOIA requests related to CRU. These amounted to 61 requests out of a 2009 total of 107 related to CRU, compared to annual totals of 2 in 2008 and 4 in 2007 (University totals for those years were 204, 72 and 44 respectively).¹³³

97. At the oral evidence session Lord Lawson commented on the increase in the volume of FOIA requests:

what had happened was there had been a very, very small number of FOI Act requests to begin with and it was in response to those that there was all the evasion, the lack of disclosure and all the other things which we have seen in the emails: discussions about possibly destroying evidence and so on. All that came well before the 2009 flood of stuff. The 2009 flood, if you look at the sequence of events, was a response to the refusal to give disclosure of various things before. That was what came first.¹³⁴

98. There are two issues here: the adequacy of CRU's handling of the FOIA requests and whether the increase in the number of requests in July 2009 was a deluge. On the latter, Mr Thomas said that, whilst agreeing that UEA had faced a significant rise in FOIA requests in July 2009, he did not consider that a total of 61 was a "huge number".¹³⁵

99. On handling, CRU claimed that it could not cope with the significant rise in FOIA requests because it only had three full-time academic staff.¹³⁶ We therefore wrote to UEA on 2 March 2010 to ask what extra resources were provided to assist CRU cope with these requests. UEA responded that:

additional support was provided to the University's Information Policy Compliance Manager (IPCM) who handles FOI requests. This included rescheduling workloads to allow him to concentrate on the CRU FOI requests and diverting secretarial support to provide additional resource. Given the high volume of requests received, the Director of Information Services (DoIS) also took an active role in the first stage of a number of requests, thus providing additional support to the IPCM. (Should any cases where the DoIS was directly involved in the first stage be appealed then we have arranged for the PVC Academic to adjudicate to ensure impartiality). ISD also fast-tracked the merging of the Security Policy and Compliance team to ensure that a fully trained back-up to the IPCM was available.¹³⁷

¹³³ Ev 20, para 3.7.4

¹³⁴ Q 9

¹³⁵ Q 68

¹³⁶ Q 92 [Professor Acton], Ev 20, para 3.7.4; Ev 37, Q 1

¹³⁷ Ev 37, para 1

100. The Science Faculty also provided additional administrative support, including that of the Director of Faculty Administration, the most senior member of the Faculty's administrative staff. UEA pointed out that many of the requests were of a very technical nature and:

required scientific knowledge and understanding of the subject area in order to provide the details. Despite the additional administrative resources provided, the requirement to respond to the 61 requests received in July 2009 impacted considerably upon the work of CRU.¹³⁸

101. We also asked UEA to outline what legal advice and guidance on handling had been offered to CRU in handling these FOIA requests. UEA confirmed that the:

IPCM provided advice to CRU on the requirements of the Act both generally, and in relation to any applicable sections, exemptions or exceptions pertaining to the specific request. In this latter role, the IPCM set out the requirements of any possible exemption or exception, inclusive of the public interest test, and elicited from CRU staff whether the public interest test had been met. Additional advanced training was provided to the 'FOI Contact' for the Faculty of Science, the Director of Faculty Administration. In this role, the FOI contact acted as a support to CRU in the location and retrieval of information and provided assistance to the IPCM in exploring the application of the Act to the specific requests.¹³⁹

102. On the evidence we took we have concerns about the handling of FOIA requests by CRU. First, the disclosed e-mails betray an attitude to freedom of information that was antipathetic to the spirit of disclosure in the legislation. Mr Thomas pointed out that:

the simplest approach, particularly where requests tend to generate either a defensive attitude or place a great burden on the public authority, is proactive disclosure in the first place.[...] Public authorities ought to decide what really has to be kept away from the public. If it is particularly sensitive or there is a good reason for withholding it, fair enough, but where there is no good reason for withholding information, then why not proactively disclose it and avoid the hassle of large numbers of requests?¹⁴⁰

103. Whether or not CRU liked it, those making FOIA requests were entitled to have their requests dealt with in accordance with the legislation and, if the information sought did not fall within one of the exclusions provided by the FOIA, it should have been disclosed. **We have already recommended in paragraph 54 above that in future information, including data and methodology, should be published proactively on the internet wherever possible. However, a culture of withholding information—from those perceived by CRU to be hostile to global warming—appears to have pervaded CRU's approach to FOIA requests from the outset. We consider this to be unacceptable.**

104. In the face of such an unhelpful approach we are not surprised that FOIA requests multiplied. When the surge in FOIA requests hit CRU in July 2009 UEA provided extra

¹³⁸ Ev 37, para 1

¹³⁹ Ev 37, para 2

¹⁴⁰ Q 70

resources but because of their technical nature the same small group of staff at CRU had a pivotal role in handling the requests. We are not clear that the culture changed. **We cannot reach a firm conclusion on the basis of the evidence we took but we must put on record our concern about the manner in which UEA allowed CRU to handle FOIA requests. Further, we found *prima facie* evidence to suggest that the UEA found ways to support the culture at CRU of resisting disclosure of information to climate change sceptics. The failure of UEA to grasp fully the potential damage to CRU and UEA by the non-disclosure of FOIA requests was regrettable. UEA needs to review its policy towards FOIA and re-assess how it can support academics whose expertise in this area is limited.**

4 Independent inquiries

105. There are two reviews underway: the Independent Climate Change Email Review led by Sir Muir Russell; and a scientific assessment panel reviewing CRU's key scientific publications. The Vice-Chancellor explained to us in oral evidence on 1 March 2010 that the reviews would focus on different matters:

Muir Russell's independent review is not looking at the science, it is looking at allegations about malpractice. As for the science itself, I have not actually seen any evidence of any flaw in the science but I am hoping, later this week, to announce the chair of a panel to reassess the science and make sure there is nothing wrong.¹⁴¹

In the event the announcement was not made until 22 March.

The Independent Climate Change Email Review

106. The Independent Climate Change Email Review is being conducted by a team, led by Sir Muir Russell. According to the Review's website the team has more than 100 years' collective expertise of scientific research methodology and a wide range of scientific backgrounds. None have any links to the Climatic Research Unit, or the United Nations' Intergovernmental Panel on Climate Change (IPCC).¹⁴²

Terms of reference

107. The Review's terms of reference are as follows:

The Independent Review will investigate the key allegations that arose from a series of hacked e-mails from the University of East Anglia's Climatic Research Unit (CRU). The review will:

1.1. Examine the hacked e-mail exchanges, other relevant e-mail exchanges and any other information held at CRU to determine whether there is any evidence of the manipulation or suppression of data which is at odds with acceptable scientific practice and may therefore call into question any of the research outcomes.

1.2. Review CRU's policies and practices for acquiring, assembling, subjecting to peer review and disseminating data and research findings, and their compliance or otherwise with best scientific practice.

1.3. Review CRU's compliance or otherwise with the University's policies and practices regarding requests under the Freedom of Information Act ('the FOIA') and the Environmental Information Regulations ('the EIR') for the release of data.

141 Q 129

142 www.cce-review.org/About.php

1.4. Review and make recommendations as to the appropriate management, governance and security structures for CRU and the security, integrity and release of the data it holds.¹⁴³

108. Sir Muir has discretion to amend or add to the terms of reference if he feels necessary, devise his own methods of working, and call on appropriate expertise, in order to investigate the allegations fully. UEA has asked for the Review to be completed by Spring 2010 and this will be made public along with UEA's response.¹⁴⁴

109. Lord Lawson, in both his written submission and his oral evidence, considered that the terms of reference "may be a bit too CRU-centric"¹⁴⁵ and "needed to be extended to include more fully the issue of the dissenting scientists".¹⁴⁶ These points were echoed in written submissions to us. Andrew Montford suggested that:

The independence of the review is not assured. Sir Muir Russell was appointed to head the review by the vice-chancellor of the University of East Anglia, [...] Edward Acton. However, the emails disclosed implicate [his] predecessor in an apparent breach of the Freedom of Information Act and there is therefore a prime-facie case that the review is not sufficiently independent. [...] The review must take evidence from sceptics. At time of writing it appears that no prominent sceptic has been contacted by Sir Muir with a view to providing evidence. Without complainants being able to make their case to the review, it is unlikely that the findings will be sound or accepted by the sceptic community.¹⁴⁷

Mike Haseler, creator of the Number 10 Petition regarding the CRU, was also critical of the Review saying that it "seems to serve no real purpose except the PR of the University to appear to be doing something."¹⁴⁸

110. Others offered amendments to the terms of reference. Professor Ross McKittrick, a professor of environmental economics, recommended that the terms of reference "should consider whether CRU scientists whose responsibilities include providing climate data to the IPCC should not serve as IPCC Lead Authors (or Coordinating Lead Authors) on any Report or Chapter that assesses evidence for or against its quality for climatic research purposes."¹⁴⁹

111. The Royal Society of Chemistry considered the terms of reference "adequate"¹⁵⁰ and Professor John Beddington suggested that they "give sufficient scope for the issue to be investigated in full".¹⁵¹ Professor Peter Cox, a former lead author on the last IPCC Working

143 Ev 39

144 "Sir Muir Russell to head the Independent Review into the allegations against the Climatic Research Unit (CRU)" UEA Press Release, 3 December 2009, www.uea.ac.uk/mac/comm/media/press/2009/dec/CRUreview

145 Q 5, Ev 1, annex containing letter dated 26 January 2010 from the Foundation to Sir Muir Russell (*not printed*)

146 Q 3

147 Ev 161, paras 22 and 24

148 Ev 139, para 27

149 Ev 140, para 3.2

150 Ev 172, para 12

151 Ev 45, para 7

Group, suggested that the “Inquiry should hear evidence on the reviewing of scientific papers and the exclusion of papers from the IPCC report. It will be critical to determine whether these decisions were carried out on the basis of scientific merit alone”.¹⁵²

112. In response to criticisms Sir Muir pointed out that the review “is not actually about the big science of global warming and making forecasts for the next hundred years”.¹⁵³ He said that “it will not be window dressing”, and UEA had “not interfered at all”.¹⁵⁴

113. **We accept the assurances that Sir Muir Russell has given about the independence of the Independent Climate Change Email Review and we expect him to be scrupulous in preserving its impartiality. We see no reason why the Review’s conclusions and UEA’s response have to be published together. Indeed, it could give the impression that UEA was being given an advantage when it comes to responding. We consider that the Review’s conclusions and recommendations should not be conveyed to UEA in advance of publication.**

114. **With regards to the terms of reference of the Review, we consider that as well as measuring CRU against current acceptable scientific practice, the Review should also make recommendations on best practice to be followed by CRU in the future. We invite Sir Muir Russell to respond formally to our Report to the extent that he sets out whether, on the basis of its contents, he finds the Terms of Reference of his inquiry need to be changed.**

The Review team

115. The Review Team membership, as announced, consisted of:

Sir Muir Russell
Professor Geoffrey Boulton
Dr Philip Campbell [*subsequently resigned*]
Professor Peter Clarke
Mr David Eyton
Professor Jim Norton.¹⁵⁵

116. Sir Muir and the Review team held a press briefing at the Science Media Centre in London on 11 February 2010 to announce its membership, publish its workplan and issue a call for submissions from interested parties. Almost immediately it was beset by claims of partiality. On the same day as the launch Sir Muir Russell accepted the resignation of Dr Philip Campbell, Editor of *Chief of Nature*, after a recording of an interview given by Dr Campbell to China Radio International in December 2009 was alleged to raise doubts over his impartiality. Dr Campbell said:

I made the remarks in good faith on the basis of media reports of the leaks. As I have made clear subsequently, I support the need for a full review of the facts behind the

¹⁵² Ev 132, para 2

¹⁵³ Q 163

¹⁵⁴ Q 166

¹⁵⁵ Ev 40

leaked e-mails. There must be nothing that calls into question the ability of the independent Review to complete this task, and therefore I have decided to withdraw from the team.¹⁵⁶

117. Sir Muir said "I have spoken to Philip Campbell, and I understand why he has withdrawn. I regret the loss of his expertise, but I respect his decision."¹⁵⁷ Further allegations arose on 12 February that Professor Geoffrey Boulton's background and views affected his ability to be a member of the Review.¹⁵⁸ These have been rejected by Sir Muir Russell and by Professor Boulton. Professor Boulton said:

At the Review press conference (on February 11), I pointed out that I had worked full-time in the School of Environmental Sciences at UEA from its inception in 1968 to 1980, and that I had a part-time appointment between 1980 and 1986, whilst working primarily in the University of Amsterdam. Since then, I have had no professional contact with the University of East Anglia or the Climatic Research Unit. I was equally clear that although my research is not in the field of modern or recent climate change, I am familiar with its scientific basis and uncertainties surrounding it. I declared my current view of the balance of evidence: that the earth is warming and that human activity is implicated. These remain the views of the vast majority of scientists who research on climate change in its different aspects. They are based on extensive work worldwide, not that of a single institution. As a sceptical scientist, I am prepared to change those views if the evidence merits it. They certainly do not prevent me from being heavily biased against poor scientific practice, wherever it arises.¹⁵⁹

Sir Muir Russell said:

This Review must determine if there is evidence of poor scientific practice, as well as investigate allegations around the manipulation and suppression of data. As others have pointed out, it would be impossible to find somebody with the qualifications and experience we need who has not formed an opinion on climate change. I am completely confident that each member of the Review team has the integrity, the expertise, and the experience to complete our work impartially.¹⁶⁰

118. In his oral evidence Sir Muir outlined his approach in choosing the team:

156 "Dr Philip Campbell withdraws from the Review", *Independent Climate Change Email Review News release*, 12 February 2010, www.cce-review.org/News.php

157 *As above*

158 There has been pressure on Professor Boulton to step down. *The Scotsman* reported: "Dr Benny Peizer, [sic] director of the Global Warming Policy Foundation, a think tank which claims the debate on climate change has become distorted, called for Prof Boulton to step down, too. He said: 'Prof Boulton obviously is a very distinguished geologist. The problem is, he is a very outspoken campaigner on this issue and he's given talks calling for galvanising public opinion. He also worked at the very institution that he is now going to be investigating. That, we think, is a conflict of interest.'" ("Senior Scots scientist in climate probe row", *The Scotsman*, 13 February 2010) Sir Muir has rejected the call. ("Allegations of bias against Review member rejected", *Independent Climate Change Email Review News release*, 15 February 2010)

159 "Allegations of bias against Review member rejected", *Independent Climate Change Email Review News release*, 15 February 2010, www.cce-review.org/News.php

160 *As above*

You can see as you look at the composition of the team that I needed to be looking at climate science in general but not somebody who was associated with this particular stream of work but would understand what was going on. There were going to be huge data handling issues, there was a lot of work on computing and data security and so on and that the work was going to have a resonance out there in the real world and around the world. Really on that basis I came up with this set of names that you can see. In relation to Dr Campbell, the others that I had got together thought that it would be extremely important to have somebody who knew about peer review and that was really the qualification that brought him in.¹⁶¹

119. It is unfortunate that the Independent Review got off to a bad start with the necessary resignation of Dr Campbell. The question of the operation of peer review is going to be a critical issue in the inquiry and the Review Team needs to take steps to ensure the insight and experience he would have brought are replaced.

Transparency

120. Contributors to our inquiry have suggested the importance that the Independent Review is open and transparent. Lord Lawson, in his oral evidence, said that he was:

concerned about the openness and transparency, [...] there should be public hearings, like you are having here—I think that is very, very important—and I regret the fact that it appears that they do not intend to do this.¹⁶²

Andrew Montford commented:

The review must be held in public. Sir Muir Russell has stated that he wants to retain the confidence of global warming sceptics. However, in his letter to Mr Willis of 10 December 2009, [...] the vice-chancellor of UEA, states that Sir Muir will present his findings to [him], who will in turn present a report to the council of the university. We are asked to believe that Sir Muir will properly investigate [the Vice-Chancellor's] role in the alleged FoI breaches, and that [he] will pass on the findings that Sir Muir makes on this subject to the university council.¹⁶³

121. When answering our question on transparency Sir Muir indicated that the Review team “plans to put on its website the evidence that we receive”.¹⁶⁴ When pressed on the question of holding public evidence sessions Sir Muir responded that:

all my predispositions and those of the fellow team members are to do it that way [via written evidence] rather than to do it in a hearing of perhaps this kind or in a series of one-to-one interviews or whatever. Where we have interviews with people in CRU or elsewhere, those will be written up and they will be part of the record but at the moment I am not really sure that getting to the stage of putting people in a

161 Q 160

162 Q 3

163 Ev 161, para 23

164 Q 172

hearing context is going to be a particularly effective way of adding value to the objective evidence that we want to get our hands on.¹⁶⁵

122. We agree that the Review must be open and transparent. **We conclude that, when the Independent Review holds oral hearings or interviews, they should be carried out in public wherever possible and that it should publish all the written evidence it receives on its website as soon as possible.**

Scientific Appraisal Panel

123. In its evidence to us the Independent Climate Change Email Review stated that its remit does not invite it to re-appraise the scientific work of CRU. That re-appraisal is being separately commissioned by UEA, with the assistance of the Royal Society.¹⁶⁶ In a statement released on 11 February UEA said that:

The Royal Society will assist the University in identifying assessors with the requisite expertise, standing and independence. “Published papers from CRU have gone through the rigorous and intensive peer review process which is the keystone for maintaining the integrity of scientific research,” said Professor Trevor Davies, the University’s Pro-Vice-Chancellor for Research, Enterprise and Engagement. “That process and the findings of our researchers have been the subject of significant debate in recent months. Colleagues in CRU have strenuously defended their conduct and the published work and we believe it is in the interests of all concerned that there should be an additional assessment considering the science itself.”

The independent reassessment will complement Sir Muir Russell’s Review of the key allegations about the handling of data arising from the publication of a series of e-mails hacked from CRU. Sir Muir’s Review is expected to announce its finding in Spring 2010.

The reassessment of CRU’s key publications will be completed at the earliest date the assessors can manage. The findings will be made public.¹⁶⁷

124. Details of the panel were announced on 22 March. It will be headed by Lord Oxburgh. His appointment was made on the recommendation of the Royal Society, which was also consulted on the choice of the six scientists on the panel: Professor Huw Davies, Professor of Physics at the Institute for Atmospheric and Climate Science at ETH Zürich; Professor Kerry Emanuel, Professor of Meteorology at Massachusetts Institute of Technology; Professor Lisa Graumlich, Director of the School of Natural Resources and the Environment at The University of Arizona; Professor David Hand, Professor of Statistics in the Department of Mathematics at Imperial College; Professor Herbert Huppert, Professor of Theoretical Geophysics at the University of Cambridge; and Professor Michael Kelly, Prince Philip Professor of Technology at the University of Cambridge. The panel will have

165 Q 176

166 Ev 40, para 4

167 UEA, 11 February 2010, www.uea.ac.uk/mac/comm/media/press/CRUstatements/New+scientific+assessment+of+climatic+research+publicatio ns+announced

access to any publications or materials it requests, and all information considered will be listed in the Report. UEA, in consultation with the Royal Society, has suggested that the panel looks in particular at key publications, from the body of CRU's research referred to in the UEA submission to our inquiry. According to the announcement on 22 March, the panel will meet in Norwich in April and will have the opportunity to see original data and speak to those who did the work and it comprises of scientists who use techniques similar to those used in CRU but who largely apply them to other areas of research, as well as those with experience in climate or related research.¹⁶⁸

125. Announcing the Panel, Professor Trevor Davies, UEA's Pro-Vice-Chancellor for Research, said that:

Our concern has been to bring together a distinguished group of independent scientists who understand the difference between assertion and evidence, and are familiar with using the latter to judge the validity of conclusions arising from science research. The panel members have the right mix of skills to understand the complex nature of climate research and the discipline-based expertise to scrutinise CRU's research. How they do this will be entirely down to the panel.

The choice of scientists is sure to be the subject of discussion, and experience would suggest that it is impossible to find a group of eminent scientists to look at this issue who are acceptable to every interest group which has expressed a view in the last few months. Similarly it is unlikely that a group of people who have the necessary experience to assess the science, but have formed no view of their own on global warming, could be found.¹⁶⁹

Public view of the climate science

126. There is no doubt that the e-mail disclosure from CRU in November 2009, and especially the extensive media coverage that has followed it ever since, has affected the general public view of climate science, both in the UK and further afield. Professor Bob Watson, Defra's Chief Scientific Adviser, told us that "the media has certainly portrayed the UEA issue as a crisis, so I think to the public it has been portrayed as a crisis".¹⁷⁰ Professor Peter Cox, a climate scientist and a lead-author on the last IPCC¹⁷¹ Working Group, in his written submission to us, said as much: "I am concerned that public confidence in the science of climate change has been undermined by the email leak".¹⁷² In its submission the Royal Society of Chemistry said that the:

true nature of science dictates that research is transparent and robust enough to survive scrutiny. A lack of willingness to disseminate scientific information may infer that the scientific results or methods used are not robust enough to face scrutiny, even if this conjecture is not well-founded. This has far-reaching consequences for

¹⁶⁸ "CRU Scientific Assessment Panel announced", UEA Press Release, 22 March 2010, www.uea.ac.uk/mac/comm/media/press/CRUstatements/SAPannounce

¹⁶⁹ *As above*

¹⁷⁰ Q 198

¹⁷¹ Intergovernmental Panel on Climate Change

¹⁷² Ev 132, para 1

the reputation of science as a whole, with the ability to undermine the public's confidence in science.¹⁷³

127. The majority of submissions submitted to our inquiry has been from those who stated that the disclosed e-mails confirmed their worries that the climate change orthodoxy has serious flaws and the actions of CRU seriously impugned the integrity of climate change research.¹⁷⁴ A representative example was the memorandum from Dr Phillip Bratby, "a semi-retired energy consultant", who said that having examined the disclosures:

It is concluded that over at least a period of 20 years, climate science has been seriously compromised by the actions of a small group of scientists who have attempted to control the debate about climate change. The effects of this are potentially profound. For example a generation of work may have been corrupted and may be unreliable. A generation of students may have been corrupted and their work may be unreliable.¹⁷⁵

128. Others offered a different perspective. Dr Timothy Osborn, a full-time member of staff at CRU, defended CRU:

It is impossible to draw firm conclusions from the hacked documents and emails. They do not represent the complete record, and they are not a random selection from the complete record. They are clearly selected with a purpose in mind and it is easy for people to fall into the traps set by those who did the selection.¹⁷⁶

129. Beyond CRU, Professor Hans von Storch and Dr Myles Allen, professional statistical climatologists, agreed that the publication of the hacked e-mails had initiated an intense debate about the credibility of climate science and that "unfortunately, this debate sometimes goes so far as to question a key result of climate science",¹⁷⁷ and the

language used in some of these e-mails has created concern, among both scientists and the public, about the openness and integrity of the scientific process. But at the same time it is critical to point out that no grounds have arisen to doubt the validity of the thermometer-based temperature record since 1850, nor any results based upon it.¹⁷⁸

130. We put the concerns about the threat to the reputation of science to the fifth panel who gave oral evidence: Professor John Beddington, Government Chief Scientific Adviser, Professor Julia Slingo, Chief Scientist, Met Office, and Professor Bob Watson, Chief Scientist, Department for Environment, Food and Rural Affairs. Professor Beddington did

173 Ev 171, para 4

174 For examples, see Ev 68 [Richard S Courtney]; Ev 77 [Walter Radtke]; Ev 78 [Geoffrey Sherrington]; and Ev 93 [Clive Menzies]

175 Ev 92, para 21

176 Ev 130, para 3

177 Ev 172, para 1

178 As above

not consider that “UK science has been damaged”.¹⁷⁹ The Met Office, in its written submission stated that

the UK enjoys a reputation for strong and robust science on the international stage. In the field of climate research the Met Office is widely acknowledged as world leading.¹⁸⁰

Professor Slingo confirmed in oral evidence that she has “absolute confidence in the science that we produce at the Met Office”,¹⁸¹ and Professor Watson, looking at the wider situation, attested that “there is absolutely no adverse effect on any of the conclusions of the IPCC.”¹⁸²

131. In our view, reputation has to be built on the solid foundation of excellent, peer-reviewed science. The review of the science to be carried out by the Scientific Appraisal Panel, which UEA announced on 22 March, should determine whether the work of CRU has been soundly built and it would be premature for us to pre-judge that review.

132. Reputation does not, however, rest solely on the quality of work as it should. It also depends on perception. It is self-evident that the disclosure of CRU e-mails has damaged the reputation of UK climate science and, as views on global warming have become polarised, any deviation from the highest scientific standards will be pounced on. As we explained in chapter 2, the practices and methods of climate science are a key issue. If the practices of CRU are found to be in line with the rest of climate science, the question would arise whether climate science methods of operation need to change. In this event we would recommend that the scientific community should consider changing those practices to ensure greater transparency.

Need for a single review

133. The final issue is whether the best interests of science are served by having two reviews or inquiries. We found this difficult to evaluate as details of the Scientific Appraisal Panel were released in a late stage in our inquiry. When we asked Sir Muir whether it would be better to have a single inquiry, he responded:

It would have been possible, obviously, to have constructed an inquiry that looked at both aspects of that, and that was not what I was asked to do. Whether I would have been the right person to be asked to do it I do not know but certainly it obviously became clear to the Vice Chancellor that there was this different issue about the confidence that one should have not in all the methodological and handling issues but in the higher level set of conclusions about what was actually happening.¹⁸³

134. The process of two reviews or inquiries is underway. In our view there is the potential for overlap between the two inquiries—for example, the question of the operation of peer

179 Q 194

180 Ev 46, para 1

181 Q 197

182 Q 198

183 Q 181

review needs to examine both methodology and quality of the science subject to review. **The two reviews or inquiries need to map their activities to ensure that there are no unmanaged overlaps or gaps. If there are, the whole process could be undermined.**

5 Conclusions

135. Consideration of the complaints and accusations made against CRU has led us to three broad conclusions.

136. Conclusion 1 **The focus on Professor Jones and CRU has been largely misplaced. On the accusations relating to Professor Jones's refusal to share raw data and computer codes, we consider that his actions were in line with common practice in the climate science community. We have suggested that the community consider becoming more transparent by publishing raw data and detailed methodologies. On accusations relating to Freedom of Information, we consider that much of the responsibility should lie with UEA, not CRU.**

137. Conclusion 2 **In addition, insofar as we have been able to consider accusations of dishonesty—for example, Professor Jones's alleged attempt to “hide the decline”—we consider that there is no case to answer. Within our limited inquiry and the evidence we took, the scientific reputation of Professor Jones and CRU remains intact. We have found no reason in this unfortunate episode to challenge the scientific consensus as expressed by Professor Beddington, that “global warming is happening [and] that it is induced by human activity”.¹⁸⁴ It was not our purpose to examine, nor did we seek evidence on, the science produced by CRU. It will be for the Scientific Appraisal Panel to look in detail into all the evidence to determine whether or not the consensus view remains valid.**

138. Conclusion 3 **A great responsibility rests on the shoulders of climate science: to provide the planet's decision makers with the knowledge they need to secure our future. The challenge that this poses is extensive and some of these decisions risk our standard of living. When the prices to pay are so large, the knowledge on which these kinds of decisions are taken had better be right. The science must be irreproachable.**

Conclusions and recommendations

Datasets

1. We recognise that some of the e-mails suggest a blunt refusal to share data, even unrestricted data, with others. We acknowledge that Professor Jones must have found it frustrating to handle requests for data that he knew—or perceived—were motivated by a desire simply to seek to undermine his work. But Professor Jones's failure to handle helpfully requests for data in a field as important and controversial as climate science was bound to be viewed with suspicion. He was obviously frustrated by other workers in the field trying to "undermine" his work, but his actions were inevitably counterproductive. Professor Jones told us that the published e-mails represented only "one tenth of 1%" of his output, which amounts to one million e-mails, and that we were only seeing the end of a protracted series of e-mail exchanges. We consider that further suspicion could have been allayed by releasing all the e-mails. In addition, we consider that had the available raw data been available online from an early stage, these kinds of unfortunate e-mail exchanges would not have occurred. In our view, CRU should have been more open with its raw data and followed the more open approach of NASA to making data available. (Paragraph 38)
2. We are not in a position to set out any further the extent, if any, to which CRU should have made the data available in the interests of transparency, and we hope that the Independent Climate Change Email Review will reach specific conclusions on this point. However, transparency and accountability are of increasing importance to the public, so we recommend that the Government reviews the rules for the accessibility of data sets collected and analysed with UK public money. (Paragraph 39)
3. We note that the research passed the peer review process of some highly reputable journals. However, we note that CRU could have been more open at that time in providing the detailed methodological working on its website. We recommend that all publicly funded research groups consider whether they are being as open as they can be, and ought to be, with the details of their methodologies. (Paragraph 45)
4. We therefore conclude that there is independent verification, through the use of other methodologies and other sources of data, of the results and conclusions of the Climate Research Unit at the University of East Anglia. (Paragraph 49)
5. Even if the data that CRU used were not publicly available—which they mostly are—or the methods not published—which they have been—its published results would still be credible: the results from CRU agree with those drawn from other international data sets; in other words, the analyses have been repeated and the conclusions have been verified. (Paragraph 51)
6. It is not standard practice in climate science and many other fields to publish the raw data and the computer code in academic papers. We think that this is problematic because climate science is a matter of global importance and of public interest, and therefore the quality and transparency of the science should be irreproachable. We

therefore consider that climate scientists should take steps to make available all the data used to generate their published work, including raw data; and it should also be made clear and referenced where data has been used but, because of commercial or national security reasons is not available. Scientists are also, under Freedom of Information laws and under the rules of normal scientific conduct, entitled to withhold data which is due to be published under the peer-review process. In addition, scientists should take steps to make available in full their methodological workings, including the computer codes. Data and methodological workings should be provided via the internet. There should be enough information published to allow verification. (Paragraph 54)

7. Critics of CRU have suggested that Professor Jones's use of the word "trick" is evidence that he was part of a conspiracy to hide evidence that did not fit his view that recent global warming is predominately caused by human activity. The balance of evidence patently fails to support this view. It appears to be a colloquialism for a "neat" method of handling data. (Paragraph 60)
8. Critics of CRU have suggested that Professor Jones's use of the words "hide the decline" is evidence that he was part of a conspiracy to hide evidence that did not fit his view that recent global warming is predominantly caused by human activity. That he has published papers—including a paper in *Nature*—dealing with this aspect of the science clearly refutes this allegation. In our view, it was shorthand for the practice of discarding data known to be erroneous. We expect that this is a matter the Scientific Appraisal Panel will address. (Paragraph 66)
9. The evidence that we have seen does not suggest that Professor Jones was trying to subvert the peer review process. Academics should not be criticised for making informal comments on academic papers. The Independent Climate Change Email Review should look in detail at all of these claims. (Paragraph 73)

Freedom of Information issues

10. We regret that the ICO made a statement to the press that went beyond that which it could substantiate and that it took over a month for the ICO properly to put the record straight. We recommend that the ICO develop procedures to ensure that its public comments are checked and that mechanisms exist to swiftly correct any mis-statements or misinterpretations of such statements. (Paragraph 91)
11. There is *prima facie* evidence that CRU has breached the Freedom of Information Act 2000. It would, however, be premature, without a thorough investigation affording each party the opportunity to make representations, to conclude that UEA was in breach of the Act. In our view, it is unsatisfactory to leave the matter unresolved simply because of the operation of the six-month time limit on the initiation of prosecutions. Much of the reputation of CRU hangs on the issue. We conclude that the matter needs to be resolved conclusively—either by the Independent Climate Change Email Review or by the Information Commissioner. (Paragraph 93)

12. If the Minister was correct to assert in July 2009 that the Government had no evidence that the current six-month time limit presents a systemic problem, then it is now clear that such evidence exists. Irrespective of whether or not CRU breached the Freedom of Information Act 2000, we recommend that the Government review the operation of section 77 of the 2000 Act and the six month limit on the initiation of prosecutions provided by section 127(1) of the Magistrates Court Act 1980. (Paragraph 95)
13. We have already recommended in paragraph 54 above that in future information, including data and methodology, should be published proactively on the internet wherever possible. However, a culture of withholding information—from those perceived by CRU to be hostile to global warming—appears to have pervaded CRU's approach to FOIA requests from the outset. We consider this to be unacceptable. (Paragraph 103)
14. We cannot reach a firm conclusion on the basis of the evidence we took but we must put on record our concern about the manner in which UEA allowed CRU to handle FOIA requests. Further, we found *prima facie* evidence to suggest that the UEA found ways to support the culture at CRU of resisting disclosure of information to climate change sceptics. The failure of UEA to grasp fully the potential damage to CRU and UEA by the non-disclosure of FOIA requests was regrettable. UEA needs to review its policy towards FOIA and re-assess how it can support academics whose expertise in this area is limited. (Paragraph 104)

The Independent Climate Change Email Review

15. We accept the assurances that Sir Muir Russell has given about the independence of the Independent Climate Change Email Review and we expect him to be scrupulous in preserving its impartiality. We see no reason why the Review's conclusions and UEA's response have to be published together. Indeed, it could give the impression that UEA was being given an advantage when it comes to responding. We consider that the Review's conclusions and recommendations should not be conveyed to UEA in advance of publication. (Paragraph 113)
16. With regards to the terms of reference of the Review, we consider that as well as measuring CRU against current acceptable scientific practice, the Review should also make recommendations on best practice to be followed by CRU in the future. We invite Sir Muir Russell to respond formally to our Report to the extent that he sets out whether, on the basis of its contents, he finds the Terms of Reference of his inquiry need to be changed. (Paragraph 114)
17. It is unfortunate that the Independent Review got off to a bad start with the necessary resignation of Dr Campbell. The question of the operation of peer review is going to be a critical issue in the inquiry and the Review Team needs to take steps to ensure the insight and experience he would have brought are replaced. (Paragraph 119)
18. We conclude that, when the Independent Review holds oral hearings or interviews, they should be carried out in public wherever possible and that it should publish all the written evidence it receives on its website as soon as possible. (Paragraph 122)

The Scientific Appraisal Panel

19. In our view, reputation has to be built on the solid foundation of excellent, peer-reviewed science. The review of the science to be carried out by the Scientific Appraisal Panel, which UEA announced on 22 March, should determine whether the work of CRU has been soundly built and it would be premature for us to pre-judge that review. (Paragraph 131)
20. Reputation does not, however, rest solely on the quality of work as it should. It also depends on perception. It is self-evident that the disclosure of the CRU e-mails has damaged the reputation of UK climate science and, as views on global warming have become polarised, any deviation from the highest scientific standards will be pounced on. As we explained in chapter 2, the practices and methods of climate science are a key issue. If the practices of CRU are found to be in line with the rest of climate science, the question would arise whether climate science methods of operation need to change. In this event we would recommend that the scientific community should consider changing those practices to ensure greater transparency. (Paragraph 132)

The two inquiries

21. The two reviews or inquiries need to map their activities to ensure that there are no unmanaged overlaps or gaps. If there are, the whole process could be undermined. (Paragraph 134)

Conclusions

22. The focus on Professor Jones and CRU has been largely misplaced. On the accusations relating to Professor Jones's refusal to share raw data and computer codes, we consider that his actions were in line with common practice in the climate science community. We have suggested that the community consider becoming more transparent by publishing raw data and detailed methodologies. On accusations relating to Freedom of Information, we consider that much of the responsibility should lie with UEA, not CRU. (Paragraph 136)
23. In addition, insofar as we have been able to consider accusations of dishonesty—for example, Professor Jones's alleged attempt to “hide the decline”—we consider that there is no case to answer. Within our limited inquiry and the evidence we took, the scientific reputation of Professor Jones and CRU remains intact. We have found no reason in this unfortunate episode to challenge the scientific consensus as expressed by Professor Beddington, that “global warming is happening [and] that it is induced by human activity”. It was not our purpose to examine, nor did we seek evidence on, the science produced by CRU. It will be for the Scientific Appraisal Panel to look in detail into all the evidence to determine whether or not the consensus view remains valid. (Paragraph 137)
24. A great responsibility rests on the shoulders of climate science: to provide the planet's decision makers with the knowledge they need to secure our future. The challenge that this poses is extensive and some of these decisions risk our standard of

living. When the prices to pay are so large, the knowledge on which these kinds of decisions are taken had better be right. The science must be irreproachable. (Paragraph 138)

Formal Minutes

Wednesday 24 March 2010

Members present:

Mr Phil Willis, in the Chair

Mr Tim Boswell
Dr Evan Harris

Dr Brian Iddon
Graham Stringer

The Committee considered this matter.

Draft Report (The disclosure of climate data from the Climatic Research Unit at the University of East Anglia), proposed by the Chair, brought up and read.

Ordered, That the draft Report be read a second time, paragraph by paragraph.

Paragraphs 1 to 46 read and agreed to.

Paragraph 47 read.

Question put, That the paragraph stand part of the Report.

The Committee divided.

Ayes, 3
Mr Tim Boswell
Dr Evan Harris
Dr Brian Iddon

Noes, 1
Graham Stringer

Paragraphs 48 to 50 read and agreed to.

Paragraph 51 read.

Question put, That the paragraph stand part of the Report.

The Committee divided.

Ayes, 3
Mr Tim Boswell
Dr Evan Harris
Dr Brian Iddon

Noes, 1
Graham Stringer

Paragraphs 52 to 65 read and agreed to.

Paragraph 66 read.

Amendment proposed, to leave out from the beginning to "We" in line 6 and insert "We have not taken enough evidence on this matter to come to a final conclusion".—(*Graham Stringer*.)

Question put, That the Amendment be made.

The Committee divided.

Ayes, 1
Graham Stringer

Noes, 3
Mr Tim Boswell
Dr Evan Harris
Dr Brian Iddon

Paragraph 66 agreed to.

Paragraphs 67 to 131 read and agreed to.

Paragraph 132 read.

Amendment proposed, to leave out from “science” in line 6 to the end and add “it would be necessary for the whole of climate science to increase its transparency and improve its scientific methodology”.—(*Graham Stringer.*)

Question put, That the Amendment be made.

The Committee divided.

Ayes, 1
Graham Stringer

Noes, 3
Mr Tim Boswell
Dr Evan Harris
Dr Brian Iddon

Paragraph 132 agreed to.

Paragraph 133 read and agreed to.

Paragraph 134 read.

Amendment proposed, at the end of line 5 to insert “Given the increasingly hostile attitudes of both sides on this issue, it is vital that these two inquiries have at least one member each who is a reputable scientist, and is sceptical of anthropogenic climate change”.—(*Graham Stringer.*)

Question put, That the Amendment be made.

The Committee divided.

Ayes, 1
Graham Stringer

Noes, 3
Mr Tim Boswell
Dr Evan Harris
Dr Brian Iddon

Paragraphs 135 and 136 read and agreed to.

Paragraph 137 read.

Amendment proposed, after “answer” in line 3 add “**Within our limited inquiry and the evidence we took, the scientific reputation of Professor Jones and CRU remains intact.**”.—(*Dr Evan Harris.*)

Question put, That the Amendment be made.

The Committee divided.

Ayes, 3	Noes, 1
Mr Tim Boswell	Graham Stringer
Dr Evan Harris	
Dr Brian Iddon	

Question put, That the paragraph, as amended, stand part of the Report.

The Committee divided.

Ayes, 3	Noes, 1
Mr Tim Boswell	Graham Stringer
Dr Evan Harris	
Dr Brian Iddon	

Paragraph 138 read and agreed to.

Summary brought up and read.

Question put, That the summary be added to the Report.

The Committee divided.

Ayes, 3	Noes, 1
Mr Tim Boswell	Graham Stringer
Dr Evan Harris	
Dr Brian Iddon	

Motion made, and Question put, That the Report be the Eighth Report of the Committee to the House.

The Committee divided.

Ayes, 3	Noes, 1
Mr Tim Boswell	Graham Stringer
Dr Evan Harris	
Dr Brian Iddon	

Resolved, That the Report be the Eighth Report of the Committee to the House.

Ordered, That the Chair make the Report to the House.

Ordered, That embargoed copies of the Report be made available, in accordance with the provisions of Standing Order No. 134.

Written evidence was ordered to be reported to the House for printing with the Report, together with written evidence reported and ordered to be published on 24 February and 1 March 2010.

Written evidence was ordered to be reported to the House for placing in the Library and Parliamentary Archives.

[The Committee adjourned

Witnesses

Wednesday 1 March 2010

The Rt Hon Lord Lawson of Blaby , Chairman, and Dr Benny Peiser , Director, Global Warming Policy Foundation	Ev 2
Richard Thomas CBE , former Information Commissioner	Ev 11
Professor Edward Acton , Vice-Chancellor, University of East Anglia and Professor Phil Jones , Director of the Climatic Research Unit	Ev 27
Sir Muir Russell , Head of the Independent Climate Change E-Mails Review	Ev 41
Professor John Beddington , Government Chief Scientific Adviser, Professor Julia Slingo OBE , Chief Scientist, Met Office, and Professor Bob Watson , Chief Scientist, Defra	Ev 58

List of written evidence

1	Andrew Montford	Ev 159
2	Anne Stallybrass	Ev 169
3	Aporia	Ev 98
4	Climate Change E-Mails Review Team	Ev 39
5	Clive Menzies	Ev 93
6	David Andrew Cockroft	Ev 168
7	David Holland	Ev 115
8	David Shaw	Ev 99
9	Douglas J. Keenan	Ev 181
10	Dr. Benny Peiser	Ev 164
11	Dr. D. R. Keiller	Ev 103
12	Dr. Michael Simons	Ev 97
13	Dr. Sonja Boehmer-Christiansen	Ev 124, Ev 127
14	Dr. Timothy J. Osborn	Ev 129
15	Edward Dilley	Ev 76
16	Eric Rasmusen	Ev 89
17	G R Ryan	Ev 78
18	Geoffrey Sherrington	Ev 78
19	Global Warming Policy Foundation	Ev 1
20	Godfrey Bloom MEP	Ev 92
21	Ian Goddard	Ev 82
22	Institute of Physics	Ev 167
23	J Ronan	Ev 197

24	John F Kelly	Ev 191
25	John Graham-Cumming	Ev 195
26	John Wadsworth	Ev 81
27	Lalu Hanuman	Ev 81
28	Martin Brumby	Ev 82
29	Met Office	Ev 46, Ev 64
30	Mike Haseler	Ev 133
31	Nicholas Barnes and David Jones	Ev 197
32	Peabody Energy Company	Ev 191
33	Peter Sinclair	Ev 82
34	Peter Taylor	Ev 186
35	Phillip Bratby	Ev 90
36	Professor Darrel Ince	Ev 152
37	Professor Hans von Storch and Dr. Myles R. Allen	Ev 172
38	Professor John Beddington, Government Chief Scientific Adviser	Ev 45, Ev 64
39	Professor Peter Cox	Ev 132
40	Professor Ross McKittrick	Ev 140
41	Public Interest Research Centre	Ev 176
42	Research Councils UK	Ev 175
43	Richard S Courtney	Ev 68
44	Richard Thomas CBE	Ev 7
45	Richard Tyrwhitt-Drake	Ev 162
46	Roger Helmer MEP	Ev 85
47	Ronald K Bolton	Ev 119, Ev 123
48	Royal Society of Chemistry	Ev 170
49	Royal Statistical Society	Ev 185
50	Stephen McIntyre	Ev 82, Ev 144
51	Stephen Prower	Ev 86
52	Steven Mosher	Ev 151
53	Stuart Huggett	Ev 77
54	Susan Ewens	Ev 83
55	University of East Anglia	Ev 16, Ev 17, Ev 25, Ev 34, Ev 37, Ev 38
56	Walter Radtke	Ev 77
57	Warwick Hughes	Ev 153

List of unprinted evidence

The following written evidence has been reported to the House, but has not been printed and copies have been placed in the House of Commons Library, where they may be inspected by Members. Other copies are in the Parliamentary Archives (www.parliament.uk/archives), and are available to the public for inspection. Requests for inspection should be addressed to The Parliamentary Archives, Houses of Parliament, London SW1A 0PW (tel. 020 7219 3074; e-mail archives@parliament.uk). Opening hours are from 9.30 am to 5.00 pm on Mondays to Fridays.

CRU 27 The Global Warming Policy Foundation annexes

CRU 58/58a Dr Nigel Dudley memoranda

List of Reports from the Committee during the current Parliament

The reference number of the Government's response to each Report is printed in brackets after the HC printing number.

Session 2009–10

First Report	The work of the Committee in 2008–09	HC 103
Second Report	Evidence Check 1: Early Literacy Interventions	HC 44 (HC 385)
Third Report	The Government's review of the principles applying to the treatment of independent scientific advice provided to government	HC 158-I (HC 384)
Fourth Report	Evidence Check 2: Homeopathy	HC 45
Fifth Report	The Regulation of Geoengineering	HC 221
Sixth Report	The impact of spending cuts on science and scientific research	HC 335-I
Seventh Report	Bioengineering	HC 220
Eighth Report	The disclosure of climate data from the Climatic Research Unit at the University of East Anglia	HC 387-I

Session 2008–09

First Report	Re-skilling for recovery: After Leitch, implementing skills and training policies	HC 48-I (HC 365)
Second Report	The Work of the Committee 2007–08	HC 49
Third Report	DIUS's Departmental Report 2008	HC 51-I (HC 383)
Fourth Report	Engineering: turning ideas into reality	HC 50-I (HC 759)
Fifth Report	Pre-appointment hearing with the Chair-elect of the Economic and Social Research Council, Dr Alan Gillespie CBE	HC 505
Sixth Report	Pre-appointment hearing with the Chair-elect of the Biotechnology and Biological Sciences Research Council, Professor Sir Tom Blundell	HC 506
Seventh Report	Spend, spend, spend? – The mismanagement of the Learning and Skills Council's capital programme in further education colleges	HC 530 (HC 989)
Eighth Report	Putting Science and Engineering at the Heart of Government Policy	HC 168-I (HC 1036)
Ninth Report	Pre-appointment hearing with the Chair-elect of the Science and Technology Facilities Council, Professor Michael Sterling	HC 887
Tenth Report	Sites of Special Scientific Interest	HC 717 (HC 990)
Eleventh Report	Students and Universities	HC 170-I (HC 991)

Session 2007–08

First Report	UK Centre for Medical Research and Innovation	HC 185 (HC 459)
Second Report	The work and operation of the Copyright Tribunal	HC 245 (HC 637)
Third Report	Withdrawal of funding for equivalent or lower level qualifications (ELQs)	HC 187-I (HC 638)
Fourth Report	Science Budget Allocations	HC 215 (HC 639)
Fifth Report	Renewable electricity-generation technologies	HC 216-I (HC 1063)
Sixth Report	Biosecurity in UK research laboratories	HC 360-I (HC 1111)

Seventh Report	Pre-legislative Scrutiny of the Draft Apprenticeships Bill	HC 1062-I (HC (2008–09)262)
First Special Report	The Funding of Science and Discovery Centres: Government Response to the Eleventh Report from the Science and Technology Committee, Session 2006–07	HC 214
Session 2007–08 (Continued)		
Second Special Report	The Last Report: Government Response to the Thirteenth Report from the Science and Technology Committee, Session 2006–07	HC 244
Fourth Special Report	Investigating the Oceans: Government Response to the Science and Technology Committee’s Tenth Report of Session 2006–07	HC 506 [incorporating HC 469–i]

RA-10 Final Investigation Report Involving Dr. Michael E. Mann
The Pennsylvania State University
June 4, 2010

Composition of the Investigatory Committee:

Sarah M. Assmann, Waller Professor
Department of Biology

Welford Castleman, Evan Pugh Professor and Eberly Distinguished Chair in Science
Department of Chemistry and Department of Physics

Mary Jane Irwin, Evan Pugh Professor
Department of Computer Science and Electrical Engineering

Nina G. Jablonski, Department Head and Professor
Department of Anthropology

Fred W. Vondracek, Professor
Department of Human Development and Family Studies

Research Integrity Officer:

Candice Yekel, Director of the Office for Research Protections

Background of the alleged misconduct as described in the RA10 Inquiry Report:

On and about November 22, 2009, The Pennsylvania State University began to receive numerous communications (emails, phone calls and letters) accusing Dr. Michael E. Mann of having engaged in acts, beginning in approximately 1998, that included manipulating data, destroying records and colluding to hamper the progress of scientific discourse around the issue of anthropogenic global warming. These accusations were based on perceptions of the content of the emails stolen from a server at the Climatic Research Unit of the University of East Anglia in Great Britain as widely reported.

Given the sheer volume of the communications to Penn State, the similarity of their content and the variety of sources, which included University alumni, federal and state politicians, and others, many of whom had had no relationship with Penn State, Dr. Eva J. Pell, then Senior Vice President for Research and Dean of the Graduate School, was asked to examine the matter. The reason for having Dr. Pell examine the matter was that the accusations, when placed in an academic context, could be construed as allegations of *research misconduct*, which would constitute a violation of Penn State policy.

Under The Pennsylvania State University's policy, Research Administration Policy No. 10, (hereafter referred to as RA-10), *Research Misconduct* is defined as:

- (1) fabrication, falsification, plagiarism or other practices that seriously deviate from accepted practices within the academic community for proposing, conducting, or reporting research or other scholarly activities;
- (2) callous disregard for requirements that ensure the protection of researchers, human participants, or the public; or for ensuring the welfare of laboratory animals;
- (3) failure to disclose significant financial and business interest as defined by Penn State Policy RA20, *Individual Conflict of Interest*;
- (4) failure to comply with other applicable legal requirements governing research or other scholarly activities.

RA-10 further provides that “research misconduct does not include disputes regarding honest error or honest differences in interpretations or judgments of data, and is not intended to resolve bona fide scientific disagreement or debate.”

On November 24, 2009, two days after receipt of the allegations, Dr. Pell initiated the process articulated in RA-10 by scheduling a meeting with the Dean of the College of Earth and Mineral Sciences (Dr. William Easterling), the Associate Dean for Graduate Education and Research of the College of Earth and Mineral Sciences (Dr. Alan Scaroni), the Director of the Office for Research Protections (Ms. Candice Yekel), and the Head of the Department of Meteorology (Dr. William Brune).

At this meeting, all were informed of the situation and of the decision to initiate an inquiry under RA-10. Dr. Pell then discussed the responsibilities that each individual would have according to the policy. Dean Easterling recused himself from the inquiry due to a conflict of interest. As the next administrator in the line of management for the college, Dr. Scaroni was asked to take on Dean Easterling’s function in the ensuing inquiry.

The Inquiry Committee assigned to conduct the inquiry into the matter consisted of Dr. Eva J. Pell, Senior Vice President for Research, Ms. Candice Yekel, Director of the Office for Research Protections, and Dr. Alan Scaroni, Associate Dean for Graduate Education and Research of the College of Earth and Mineral Sciences. Dr. William Brune, Head of the Department of Meteorology, was to serve in a consulting capacity for the Inquiry Committee. Dr. Henry C. Foley, then Dean of the College of Information Sciences and Technology, was added to the Inquiry Committee in an ex-officio role for the duration of 2009, since he had been named to succeed Dr. Pell as the next Vice President for Research, beginning January 1, 2010.

At the time of initiation of the inquiry, no formal allegations accusing Dr. Mann of research misconduct had been submitted to any University official. Therefore, the emails and other communications were reviewed by Dr. Pell, and from these she synthesized the following four formal allegations. To be clear, these were not allegations that Dr. Pell put forth but rather her best effort to reduce to reviewable allegations the many different accusations that were received from parties outside of the University. The four synthesized allegations were as follows:

1. Did you engage in, or participate in, directly or indirectly, any actions with the intent to suppress or falsify data?
2. Did you engage in, or participate in, directly or indirectly, any actions with the intent to delete, conceal or otherwise destroy emails, information and/or data, related to AR4, as suggested by Phil Jones?
3. Did you engage in, or participate in, directly or indirectly, any misuse of privileged or confidential information available to you in your capacity as an academic scholar?
4. Did you engage in, or participate in, directly or indirectly, any actions that seriously deviated from accepted practices within the academic community for proposing, conducting, or reporting research, or other scholarly activities?

On November 29, 2009, Dr. Pell and Dr. Foley met with Dr. Mann to inform him personally that he had been accused of research misconduct and that an inquiry under RA-10 would take place. On November 30, 2009, a letter was delivered by Dr. Pell to Dr. Mann to notify him of these allegations and Dr. Pell's decision to conduct an inquiry under RA-10. The inquiry phase of RA-10 was thereby formally initiated on November 30, 2009.

From November 30 to December 14, 2009, staff in the Office for Research Protections culled through the 1073 files that contained emails or email strings that were purloined from a server at the University of East Anglia. A subset of the files containing emails or email strings was reviewed. This subset of files included emails that were sent by Dr. Mann, were sent to Dr. Mann, were copied to Dr. Mann, or discussed Dr. Mann (but were neither addressed nor copied to him). In summary, the following were found:

- 206 files that contained emails or email strings that contained message/text from Dr. Mann somewhere in the chain;
- 91 files that contained emails or email strings that were received by Dr. Mann, but in which he did not participate; and
- 79 files that contained emails or email strings that dealt with Dr. Mann, his work or publications but that he neither authored nor was listed as copied.

From among these 376 files, the Inquiry Committee focused on 47 files that contained emails or email strings that were deemed relevant. On December 17, 2009, the Inquiry Committee (Pell, Scaroni, Yekel), Dr. Brune and Dr. Foley met to review the emails, the RA-10 inquiry process, and their respective activities. It was agreed that these individuals would meet again in early January and that they would use the time until that meeting to review the relevant information, including the above mentioned e-mails, journal articles, OP-ED columns, newspaper and magazine articles, the National Academy of Sciences report entitled "Surface Temperature Reconstructions for the Last 2,000 Years," ISBN: 0-309-66144-7 and various blogs on the internet.

On January 4, 2010, Dr. Foley, in his capacity as the new Vice President for Research and Dean of the Graduate School, became the convener of the Inquiry Committee as Dr. Pell had left the University to become the Under-Secretary of Science for the Smithsonian Institution. On January 8, 2010, Dr. Foley convened the Inquiry Committee to discuss their thoughts on the evidence presented in the emails and other publically available materials. At this meeting, it was decided that each Inquiry Committee member would send to Dr. Foley specific questions to be used by the Inquiry Committee during the interview of Dr. Mann. During the interview, Dr. Foley would moderate the interview and ask each of the initial questions with follow-up questions coming from the other Inquiry Committee members.

On January 12, 2010, the Inquiry Committee (Foley, Yekel, Scaroni) and Dr. Brune met with Dr. Mann. Dr. Mann was asked to address the four allegations leveled against him and to provide answers to the fifteen additional questions that the Inquiry Committee had compiled. In an interview lasting nearly two hours, Dr. Mann addressed each of the questions and follow-up questions. A recording was made of the interview and was later transcribed. The Inquiry Committee members asked occasional follow-up questions. Dr. Mann answered each question carefully:

- He explained the content and meaning of the emails about which the Inquiry Committee inquired;
- He stated that he had never falsified any data, nor had he had ever manipulated data to serve a given predetermined outcome;
- He stated that he never used inappropriate influence in reviewing papers by other scientists who disagreed with the conclusions of his science;
- He stated that he never deleted emails at the behest of any other scientist, specifically including Dr. Phil Jones, and that he never withheld data with the intention of obstructing science; and
- He stated that he never engaged in activities or behaviors that were inconsistent with accepted academic practices.

On January 15, 2010, Dr. Foley conveyed via email on behalf of the Inquiry Committee an additional request to Dr. Mann. Dr. Mann was asked to produce all emails related to the fourth IPCC report ("AR4"), the same emails that Dr. Phil Jones had suggested that he delete. On January 18, 2010, Dr. Mann provided a zip-archive of these emails and an explanation of their content. In addition, Dr. Mann provided a ten page supplemental written response to the matters discussed during his interview.

On January 22, 2010, the Inquiry Committee and Dr. Brune met again to review the evidence, including but not limited to Dr. Mann's answers to the Inquiry Committee's questions, both in the interview and in his subsequent submissions. Dr. Foley reviewed the relevant points of his conversation with Dr. Gerald North, a professor at Texas A&M University and the first author of the NAS 2006 report that included Dr. Mann's research on paleoclimatology. Dr. Foley also relayed the sentiment and view of Dr. Donald Kennedy of Stanford University and the former editor of Science Magazine about the controversy currently swirling around Dr. Mann and some of his colleagues. Both were

very supportive of Dr. Mann and of the credibility of his science. Dr. Brune gave his opinions and suggestions for next steps of the process, and then was dismissed from further discussion pursuant to RA-10 policy role which was consult to the rest of the Inquiry Committee members.

On January 26, 2010, Dr. Foley convened the Inquiry Committee, along with University counsel, Mr. Wendell Courtney, Esq., in case issues of procedure arose.

After a careful review of all written material, and information obtained from the purloined emails, the interview of Dr. Mann, the supplemental materials provided by Dr. Mann and all the information from other sources, the Inquiry Committee found as follows with respect to each allegation:

Allegation 1: "Did you engage in, or participate in, directly or indirectly, any actions with the intent to suppress or falsify data? "

Decision 1: The Inquiry Committee determined there was no substance to this allegation and further investigation of this allegation was not warranted.

Allegation 2: "Did you engage in, or participate in, directly or indirectly, any actions with the intent to delete, conceal or otherwise destroy emails, information and/or data, related to AR4, as suggested by Phil Jones?"

Decision 2: The Inquiry Committee determined there was no substance to this allegation and further investigation of this allegation was not warranted.

Allegation 3: "Did you engage in, or participate in, directly or indirectly, any misuse of privileged or confidential information available to you in your capacity as an academic scholar?"

Decision 3: The Inquiry Committee determined there was no substance to this allegation and further investigation of this allegation was not warranted.

Allegation 4: "Did you engage in, or participate in, directly or indirectly, any actions that seriously deviated from accepted practices within the academic community for proposing, conducting, or reporting research or other scholarly activities?"

Decision 4: The Inquiry Committee determined that "given that information emerged in the form of the emails purloined from CRU in November 2009, which have raised questions in the public's mind about Dr. Mann's conduct of his research activity, given that this may be undermining confidence in his findings as a scientist, and given that it may be undermining public trust in science in general and climate science specifically, an Investigatory Committee of faculty peers from diverse fields should be constituted under RA-10 to further consider this allegation."

An Investigatory Committee of faculty members with impeccable credentials was appointed and asked to present its findings and recommendations to Dr. Henry C. Foley within 120 days of being charged.

The charge to the RA-10 Investigatory Committee:

The Investigatory Committee was charged by Dr. Henry C. Foley, Vice President for Research, on March 4, 2010, as follows:

The Investigatory Committee's charge is to determine whether or not Dr. Michael Mann engaged in, or participated in, directly or indirectly, any actions that seriously deviated from accepted practices within the academic community for proposing, conducting, or reporting research or other scholarly activities.

Sources of support for the related research or publications:

Dr. Mann's research has been sponsored by many different agencies including the National Science Foundation, the Department of Energy and the National Oceanic and Atmosphere Administration.

Documents available to the Investigatory Committee:

- 376 files containing emails stolen from the Climate Research Unit (CRU) of the University of East Anglia and originally reviewed by the Inquiry Committee
- Documents collected by the Inquiry Committee
- Documents provided by Dr. Mann at both the Inquiry and Investigation phases
- Penn State University's RA-10 Inquiry Report
- House of Commons Report HC387-I, March 31, 2010
- National Academy of Science letter titled, "Climate Change and the Integrity of Science" that was published in Science magazine on May 7, 2010
- Information on the peer review process for the National Science Foundation (NSF)
- Department of Energy's Guide to Financial Assistance
- Information on National Oceanic and Atmospheric Administration's peer review process
- Information regarding the percentage of NSF proposals funded
- Dr. Michael Mann's *curriculum vitae*

Interview process:

The interviews were audio-taped and verbatim transcripts were prepared. All interviewed individuals were provided an opportunity to review the transcripts of their interviews for accuracy. The transcripts will be maintained in the Office for Research Protections as part of the official record. Statements or information relevant to the Investigatory Committee's findings are noted in the paragraphs below. The Investigatory Committee interviewed the following individuals:

April 12, 2010: Dr. William Easterling, Dean, College of Earth and Mineral Sciences,
The Pennsylvania State University
April 14, 2010: Dr. Michael Mann, Professor, Department of Meteorology, The
Pennsylvania State University
April 20, 2010: Dr. William Curry, Senior Scientist, Geology and Geophysics
Department, Woods Hole Oceanographic Institution
April 20, 2010: Dr. Jerry McManus, Professor, Department of Earth and Environmental
Sciences, Columbia University
May 5, 2010: Dr. Richard Lindzen, Alfred P. Sloan Professor, Department of Earth,
Atmospheric and Planetary Sciences, Massachusetts Institute of
Technology

**Summary of Investigatory Committee's Interview with Dr. Michael E. Mann,
Professor, Department of Meteorology, Penn State University – April 14, 2010**

On April 14, 2010, the RA-10 Investigatory Committee (Assmann, Castleman, Irwin, Jablonski, and Vondracek) and Candice Yekel interviewed Dr. Michael Mann. In advance of the interview, the Investigatory Committee prepared several questions focusing on whether Dr. Mann “engaged in, or participated in, directly or indirectly, any actions that seriously deviated from accepted practices within the academic community for preparing, conducting, or reporting research or other scholarly activities.” In addition to the prepared questions, Investigatory Committee members asked a number of follow-up questions. Dr. Mann answered the questions in a detailed manner.

The first question was “Would you please tell us what you consider in your field to be accepted, standard practice with regard to sharing data?” A follow-up question asked how Dr. Mann had dealt with requests for data that were addressed to him during the period covered by the stolen emails. Dr. Mann offered a brief historical perspective on the issue of sharing data in his field, concluding with the observation that data are made generally available (e.g., in the NOAA public database) after those scientists who obtained the data have had a chance to be the first to publish findings based on the data. He noted that sometimes data are made available on a collegial basis to specific scientists before those who collected the data have published their initial findings. Typically, this involves a request to not release the data to others until the data are made publically available by the scientists who obtained the data. Dr. Mann concluded his answer by stating that he has always worked with data obtained by other scientists, and that when such data were not already in the public domain, he made them available as soon as he was permitted to do so by those who initially obtained the data.

Dr. Mann drew a distinction between actual data and intermediate data that are produced as part of the analytic procedures employed. He indicated that while such intermediate data may occasionally be shared with colleagues, it is not standard practice to publish or make generally available this intermediate data (to which he and others refer to as “dirty laundry” in one of the purloined emails). Finally, he indicated that someone who wanted to reproduce his work would be able to independently reproduce this intermediate data and that, in fact, other researchers had done this.

The Investigatory Committee next inquired how he constructed his source codes and what he considered to be accepted practice in his field for publishing source codes. Dr. Mann indicated that in his field of study, in contrast with some other fields such as economics, publishing the source code was never standard practice until his work and that of his colleagues came under public scrutiny, resulting in public pressure to do so. He indicated that he initially was reluctant to publish his source codes because the National Science Foundation had determined that source codes were the intellectual property of the investigator. Also, he developed his source codes using a programming language (FORTRAN 77) that was not likely to produce identical results when run on a computer system different from the one on which it was developed (e.g., different processor makes/models, different operating systems, different compilers, different compiler optimizations). Dr. Mann reported that since around 2000, he has been using a more accessible programming style (MATLAB), and since then he has made all source codes available to the research community.

The next question was "Do you believe that the perceived hostility and perceived ulterior motives of some critics of global climate science influenced your actions with regard to the peer review process, particularly in relation to the papers discussed in the stolen emails?" Dr. Mann responded by affirming his belief in the importance of the peer review process as a means of ensuring that scientifically sound papers are published, and not as a means of preventing the publication of papers that are contrary to one's views. He elaborated by stating that some of the emails regarding this issue dealt with his concern (shared by other scientists, the publisher, and some members of the editorial board of the journal in question) that the legitimacy of the peer review process had been subverted.

Next, Dr. Mann was asked "Did you ever, without first getting express permission from the original authors, forward to a third party an in-press or submitted manuscript on which you were not a co-author?" In response to this question, Dr. Mann first responded by saying that to the best of his knowledge he had not done so. He then clarified that he may have forwarded such a manuscript to a specific, close colleague, in the belief that permission to do so had been implicit, based on his close collegial relationships with the paper's authors. An illustrative case of such a circumstance would have been the manuscript by Wahl and Ammann, which Dr. Mann forwarded to Dr. Briffa. In response to a follow-up question, Dr. Mann asserted that such judgments about implied consent are quite typical in his field, but they are made only as long as it is understood that such sharing would take place only among trusted colleagues who would maintain the confidentiality of the manuscript.

The next question for Dr. Mann was posed as follows: "What is your reply to the email statements of Dr. McIntyre (a) that he had been referred to an incorrect version of your data at your FTP site (b) that this incorrect version was posted prior to his request and was not formulated expressly for him and (c) that to date, no source code or other evidence has been provided to fully demonstrate that the incorrect version, now deleted, did not infect some of Mann's and Rutherford's other work?" Dr. Mann responded by

stating that neither he, nor many of his colleagues, put much reliability in the various accusations that Dr. McIntyre has made, and that, moreover, there is “no merit whatsoever to Mr. McIntyre’s claims here.” Specifically, Dr. Mann repeated that all data, as well as the source codes requested by Dr. McIntyre, were in fact made available to him. All data were listed on Dr. Mann’s FTP site in 2000, and the source codes were made available to Dr. McIntyre about a year after his request was made, in spite of the fact that the National Science Foundation had ruled that scientists were not required to do so. The issue of an “incorrect version” of the data came about because Dr. McIntyre had requested the data (which were already available on the FTP site) in spreadsheet format, and Dr. Rutherford, early on, had unintentionally sent an incorrectly formatted spreadsheet.

In response to a couple of follow-up questions, Dr. Mann stressed that the stolen emails represent part of a larger context of active communication among scientists, and that he remains on friendly terms with scientists with whom he has had ongoing, and sometimes heated, disagreements about scientific matters. He also commented that he and other scientists fear that the stolen emails will have a chilling effect on the way scientists communicate with each other, partly because members of the public may not appreciate the lingo or jargon (e.g., “dirty laundry” or “trick”) that scientists often use when communicating with each other about their science.

At the conclusion of the interview, Dr. Mann indicated that he would be very happy to provide additional information if the Investigatory Committee felt that this would be helpful.

Summary of Investigatory Committee Interview with Dr. William Easterling, Dean, College of Earth and Mineral Sciences, Penn State University – April 12, 2010

On April 12, 2010, the RA-10 Investigatory Committee (Assmann, Castleman, Irwin, Jablonski, and Vondracek) and Candice Yekel interviewed Dr. William Easterling, Dean of the College of Earth and Mineral Sciences, Penn State University. The Investigatory Committee had a number of prepared questions, starting with a request to learn how Dr. Easterling knew Dr. Mann. Dr. Easterling reported that he had known Dr. Mann for about six or seven years prior to his appointment at Penn State in 2008. In response to a question about when and how he had become aware of the allegations against Dr. Mann, Dr. Easterling reported that it was the week before Thanksgiving 2009, when he started receiving emails suggesting a connection between the stolen East Anglia emails and Dr. Mann’s work.

The next question for Dr. Easterling was posed as follows: “In your judgment, are accepted and ethical research practices in scientific fields related to global climate change significantly different from such practices in other fields of scientific inquiry?” Dr. Easterling’s response to that question was “Absolutely not!” In a follow-up question, Dr. Easterling was asked whether he saw any difference between certain kinds of experimental scientific fields and observational ones like paleoclimatology. He responded by stating that much of what we know about climate change is the result of a combination

of observation and numerical modeling, making the classic idea of falsification of a hypothesis, which may be applicable to a laboratory science, of limited applicability in the study of climate change. Thus, even though there are a number of highly sophisticated, physically sound models that are used to analyze and predict various features of the earth's climate system, human judgments are invariably involved, and a certain amount of subjectivity is introduced.

Another follow-up question inquired about the likely number of different statistical models that might be applicable to Dr. Mann's work. Dr. Easterling indicated that Dr. Mann and his colleagues were primarily interested in looking at historical data (which tend to be "noisy"), using a relatively small number of statistical models, such as principal components analysis, which has a long tradition in various sciences.

The next question addressed to Dr. Easterling was whether, in his judgment, Dr. Mann's work was very aggressive, very conservative, or somewhere in the middle in how it portrayed global warming. Dr. Easterling responded by stating that Dr. Mann's early work showed a more dramatic upturn in warming, but that his more recent work has led to the conclusion that the change has been slightly less dramatic. Moreover, Dr. Easterling added that Dr. Mann's findings have been replicated by independent teams of researchers.

Dr. Easterling was asked whether he knew of any other investigations related to the stolen emails other than the University of East Anglia and Penn State University, and he responded that he was unaware of any others.

The Investigatory Committee then questioned Dr. Easterling about various scientists in the field of climate science who might be interviewed by the Investigatory Committee regarding their views of what constitutes accepted and ethical practice with regard to the conduct of research in the field. The Investigatory Committee wanted a choice of scientists who had disagreed with Dr. Mann's findings as well as others who had agreed but who had not collaborated with Dr. Mann or his collaborators.

At the conclusion of the interview, Dr. Easterling offered to be available to the Investigatory Committee if the Investigatory Committee members thought that this would be helpful.

Summary of Investigatory Committee Interview with Dr. William Curry, Senior Scientist, Geology and Geophysics Department, Woods Hole Oceanographic Institution – April 20, 2010

On April 20, 2010, the RA-10 Investigatory Committee (Assmann, Castleman, Irwin, Jablonski, and Vondracek) and Candice Yekel interviewed Dr. William Curry, Senior Scientist, Geology and Geophysics Department, Woods Hole Oceanographic Institution. The Investigatory Committee had four prepared questions, but Investigatory Committee members were free to ask additional questions as well as follow-up questions as they saw fit.

The first question addressed to Dr. Curry was: "Would you please tell us what you consider in your field to be accepted standard practice with regard to sharing data and unpublished manuscripts?" With regard to sharing data, Dr. Curry indicated that standard practice is that once a publication occurs, the pertinent data are shared via some electronic repository. He stated that not all researchers actually comply with this practice, and that there may be special arrangements with the funding agency, or the journal that publishes the research, that specify when data need to be made available to other researchers. In Dr. Curry's case, for example, the National Science Foundation allows a two-year window during which he has exclusive rights to his data. After that period he must make it available to others.

On the issue of sharing unpublished manuscripts, Dr. Curry stated that if the manuscript was accompanied by a request to keep it confidential, he would not share it with anyone; if it was not accompanied by an explicit request for confidentiality, he might talk about it with colleagues but would not usually forward it.

Next, Dr. Curry was asked: "Would you please briefly explain how codes are developed in the process of evaluating data in your field, e.g., are these codes significantly different from published software packages? Then please tell us what you consider in your field to be accepted standard practice with regard to sharing codes." Dr. Curry reported that in his area, most codes are fairly basic and researchers use software packages to construct them. He also reported that he was not aware of any public archive for such codes, but that he was fairly certain that if he asked another researcher to share such codes, he would most likely get them. He added that overall compliance with requests to share codes would probably be equal to the rate of compliance with requests for sharing data.

Next, Dr. Curry was asked to respond to the following: "How do the processes of data acquisition, analysis and interpretation in paleoclimatology affect practices of data sharing in the field? Are any of these processes unique to paleoclimatology?" Dr. Curry asked for clarification and was told that the question referred to whether the laborious and expensive way in which most data are collected in paleoclimatology had an effect on data sharing. He then responded that requests for raw data would be the exception rather than the rule, because transforming the raw data into usable information is labor intensive and difficult. Nevertheless, because of NSF requirements, he would release all data after two years. He added that some scientists, however, do seek to maintain proprietary access to their data even after two years.

Finally, Dr. Curry was asked whether he wanted to share anything else with the Investigatory Committee. In his concluding comments to the Investigatory Committee, Dr. Curry noted that in the last ten years things have changed rather rapidly with regard to sharing data and information. He reported that he has become more aware of how he would be affected if people started asking him step-by-step details of his work, and that while he has always been diligent about documenting his work, ten years ago he would not have been able to document every single step in his analytical work. Thus, "accepted practices" are not fixed and are always evolving.

**Summary of Investigatory Committee Interview with Professor Jerry McManus,
Professor, Department of Earth and Environmental Sciences, Columbia University
– April 20, 2010**

On April 20, 2010, the RA-10 Investigatory Committee (Assmann, Castleman, Irwin, Jablonski, and Vondracek) and Candice Yekel interviewed Dr. Jerry McManus, Professor, Department of Earth and Environmental Sciences, Columbia University. The Investigatory Committee had four prepared questions, but Investigatory Committee members were free to ask additional questions as well as follow-up questions as they saw fit.

To start the interview, Dr. McManus was asked to respond to the following question: “Would you please tell us what you consider in your field to be accepted standard practice with regard to sharing data [and] . . . with regard to sharing unpublished manuscripts?” Dr. McManus responded by first drawing a distinction between published and unpublished data, noting, however, that there is a range of standard practices with regard to both. Nevertheless, the mode of behavior regarding unpublished data is to share “in a fairly limited fashion with individuals or groups who make specific requests and typically who are known to the researcher.” Regarding published data, Dr. McManus indicated that standard practice is to make such data available through any of a broad range of means, including providing access to electronic repositories and institutional archives.

Regarding the sharing of unpublished manuscripts, Dr. McManus indicated that there is a broad range of typical and accepted behaviors, with such manuscripts commonly shared with a limited number of colleagues. In a follow-up question, it was inquired whether it may be considered standard practice to share an unpublished manuscript with others without getting express permission to do so from the author. Dr. McManus responded by saying “no” to such sharing as standard practice, but allowing that there is not necessarily only one acceptable practice, as permission may be given implicitly or explicitly. Without specific encouragement for wider distribution, however, it is generally understood, according to Dr. McManus, that unpublished papers are not intended for third-party distribution.

The next question was stated as follows: “Would you please briefly explain how codes are developed in the process of evaluating data in your field (e.g., are these codes significantly different from published software packages)? Then please tell us what you consider in your field to be accepted, standard practice with regard to sharing codes.” Dr. McManus indicated that most, but not all, details of such methods are usually reported when research is published, and that some of these details may be shared in a “somewhat ad hoc basis.” Generally, however, the tendency is to “try to provide the conditions by which any research can be replicated. . . .” Dr. McManus agreed that generally, codes are treated the same way as any other method.

Summary of Investigatory Committee Interview with Dr. Richard Lindzen, Alfred P. Sloan Professor, Department of Earth, Atmospheric, and Planetary Sciences, Massachusetts Institute of Technology – May 5, 2010

On May 5 2010, the RA-10 Investigatory Committee (Assmann, Irwin, Jablonski, Vondracek; Dr. Castleman was not available) and Candice Yekel interviewed Dr. Richard Lindzen, Professor, Department of Earth, Atmospheric, and Planetary Sciences, Massachusetts Institute of Technology. The Investigatory Committee had four prepared questions, but Investigatory Committee members were free to ask additional questions as well as follow-up questions as they saw fit.

Before the Investigatory Committee's questioning began, Dr. Lindzen was given some general background information regarding the process of inquiry and investigation into allegations concerning Dr. Mann, with a focus on the particular allegation that is the subject of the current review by the Investigatory Committee. Dr. Lindzen then requested, and was provided with, a brief summary of the three allegations previously reviewed. When told that the first three allegations against Dr. Mann were dismissed at the inquiry stage of the RA-10 process, Dr. Lindzen's response was: "It's thoroughly amazing. I mean these are issues that he explicitly stated in the emails. I'm wondering what's going on?"

The Investigatory Committee members did not respond to Dr. Lindzen's statement. Instead, Dr. Lindzen's attention was directed to the fourth allegation, and it was explained to him that this is the allegation which the Investigatory Committee is charged to address. Dr. Lindzen was then asked the first question formulated by the Investigatory Committee: "Would you please tell us what you consider in your field to be accepted, standard practice with regard to sharing data, and the second part of the question is would you tell us what you consider in your field to be accepted, standard practice with regard to sharing unpublished manuscripts?"

Dr. Lindzen responded by stating that "with respect to sharing data, the general practice is to have it available." With respect to unpublished manuscripts, he indicated that "those are generally not made available unless the author wishes to." In response to a number of follow-up questions, Dr. Lindzen indicated that if an unpublished manuscript is sent to a scientist by the author, it would be common practice to ask for permission before sharing it with others; if it was sent by someone else it would be common practice to ask if they had permission to share the paper. According to Dr. Lindzen, a scientist might conclude that there is implicit permission to disseminate an unpublished paper only when the author made it clear that the results may be disseminated.

The next question inquired whether, in Dr. Lindzen's view, climatologists normally make their codes (used in the analysis of data) available for other people to download. Dr. Lindzen responded by stating that "it depends." He elaborated, saying that if the codes are very standard, it is unnecessary to share them, but if it's an unusual analysis it would be his practice to make the codes available to anyone who wishes to check them. In a follow-up question, Dr. Lindzen was asked whether he would have issues with people

running into compatibility issues or compilation issues. He responded by saying that even if people “screw it up” or if you have reservations about sharing codes, “if somebody asks you how did you get this, you really should let them know.”

The next questions presented to Dr. Lindzen were as follows: “How do the processes of data acquisition, analysis, and interpretation in paleoclimatology affect practices of data sharing in the field? Are any of these processes unique to paleoclimatology?” Dr. Lindzen indicated that he did not think that these processes are unique to paleoclimatology, and that since most of the data are acquired using public funds, there is no basis for investigators being proprietary with their data. In response to a follow-up question, Dr. Lindzen acknowledged that prior to publication, scientists may have a variety of reasons to keep things confidential, but after publication “there’s an obligation to explain exactly how you got them, especially if they’re controversial.”

Standard of proof used by the Investigatory Committee:

Preponderance of the evidence (happen more likely than not or 51% certainty). All committee votes are unanimous unless otherwise indicated.

Level of intent considered by the Investigatory Committee:

The Investigatory Committee considered various levels of intent in order of increasing severity from *careless*, to *reckless*, to *knowingly*, to *intentional*. These terms are defined as follows:

- *careless* - a reasonable person would not have known better or honest error – this is not considered research misconduct.
- *reckless* - a reasonable person should have known better.
- *knowingly* - a reasonable person knew better but did it anyway.
- *intentional (purposeful)* – a reasonable person knew better but did it anyway with the intent to deceive.

The level of intent regarding the specific allegation will be addressed below.

Summary of Investigation:

The Investigatory Committee investigated the following potential acts of misconduct:

“Did Dr. Michael Mann engage in, or participate in, directly or indirectly, any actions that seriously deviated from accepted practices within the academic community for proposing, conducting, or reporting research or other scholarly activities?”

The Investigatory Committee was given access to 376 files that contained emails stolen from the Climate Research Unit (CRU) of the University of East Anglia. These emails were either sent by Dr. Mann, sent to Dr. Mann, copied to Dr. Mann, or discussed Dr. Mann (but were neither addressed nor copied to him). The Investigatory Committee also

reviewed the documents collected by the Inquiry Committee, as well as the Inquiry Committee's findings and report. In addition, the Investigatory Committee reviewed a number of documents provided by Dr. Mann in response to requests from both the Inquiry and Investigatory Committees. A number of public documents were also made available to the Investigatory Committee, including a number of editorials, both pro and con Dr. Mann, an open letter from 255 members of the National Academy of Sciences, published in *Science* magazine, May 7, 2010, and the full text of the British House of Commons' Science and Technology Committee report on "The disclosure of climate data from the Climatic Research Unit at the University of East Anglia," which was published on March 31, 2010.

In the course of the investigation, the Investigatory Committee interviewed Dr. Michael Mann, as well as his immediate supervisor, Dr. William Easterling, Dean of the College of Earth and Mineral Sciences at the Pennsylvania State University. Dean Easterling and Dr. David Verardo, National Science Foundation Program Director for Paleo Perspectives on Climate Change, agreed to suggest names of eminent scientists who might agree to be interviewed by the Investigatory Committee in its efforts to establish the range of "accepted practices within the academic community for proposing, conducting, or reporting research or other scholarly activities." As previously described, the Investigatory Committee contacted, and subsequently interviewed, three eminent scientists from the field of climate research: Dr. William Curry, Senior Scientist, Geology and Geophysics Department, Woods Hole Oceanographic Institution; Dr. Richard Lindzen, Alfred P. Sloan Professor, Department of Earth, Atmospheric, and Planetary Sciences, Massachusetts Institute of Technology; and Dr. Jerry McManus, Professor, Department of Earth and Environmental Sciences, Columbia University.

Based on the documentary evidence and on information obtained from the various interviews, the Investigatory Committee first considered the question of whether Dr. Mann had seriously deviated from accepted practice in *proposing* his research activities. First, the Investigatory Committee reviewed Dr. Mann's activities that involved proposals to obtain funding for the conduct of his research. Since 1998, Dr. Mann received funding for his research mainly from two sources: The National Science Foundation (NSF) and the National Oceanic and Atmospheric Administration (NOAA). Both of these agencies have an exceedingly rigorous and highly competitive merit review process that represents an almost insurmountable barrier to anyone who proposes research that does not meet the highest prevailing standards, both in terms of scientific/technical quality and ethical considerations.

NOAA and NSF research grant proposals are both evaluated through similarly rigorous and transparent merit review (peer review) processes. To illustrate, we describe the NSF review process, which has two stages. In Stage 1, proposals are sent out to several external experts for merit review (mail review) based on the two NSF review criteria established by the National Science Foundation Board -- Intellectual Merit and Broader Impacts. In Stage 2, the proposal and its external expert reviews (mail reviews) are taken to a 8-15 person external expert panel and evaluated over a several day period (panel review). Panel review members are not the same persons as the mail review members. In

Stage 1, the external reviewers only see individual proposals and rate them on a 5-point scale in descending order from Excellent, Very Good, Good, Fair, and Poor. In Stage 2, the entire panel (except those members who have a conflict of interest with the proposal) see all the proposals in the competition (usually about 140 proposals in the NSF program to which Dr. Mann has typically submitted his proposals) and rate them based on the same two NSF criteria on the same rating scale, but at this stage they evaluate the proposals in comparison with all the other proposals that were submitted. All reviews are then taken under advisement by the director of the particular NSF program to which the proposal was submitted, who then recommends whether a project should be funded. The program director is guided by the expert reviews, but may also take programmatic balance and other NSF criteria into account before making a final recommendation. The rate of funding varies by program, but rarely exceeds 25 percent.

The results achieved by Dr. Mann in the period 1999-2010, despite these stringent requirements, speak for themselves: He served as principal investigator or co-principal investigator on five NOAA-funded and four NSF-funded research projects. During the same period, Dr. Mann also served as co-investigator of five additional NSF- and NOAA-funded research projects, as well as on projects funded by the Department of Energy (DOE), the United States Agency for International Development (USAID), and the Office of Naval Research (ONR). This level of success in proposing research, and obtaining funding to conduct it, clearly places Dr. Mann among the most respected scientists in his field. Such success would not have been possible had he not met or exceeded the highest standards of his profession for proposing research.

The second part of the Investigatory Committee's charge was to investigate whether Dr. Mann had engaged in any actions that seriously deviated from accepted practices within the academic community for *conducting* research or other scholarly activities. One focus of the committee's investigation centered on whether Dr. Mann had deviated from accepted practice with regard to sharing data and source codes with other investigators. First, the Investigatory Committee established that Dr. Mann has generally used data collected by others, a common practice in paleoclimatology research. Raw data used in Dr. Mann's field of paleoclimatology are laboriously collected by researchers who obtain core drillings from the ocean floor, from coral formations, from polar ice or from glaciers, or who collect tree rings that provide climate information from the past millennium and beyond. Other raw data are retrieved from thousands of weather stations around the globe. Almost all of the raw data used in paleoclimatology are made publicly available, typically after the originators of the data have had an initial opportunity to evaluate the data and publish their findings. In some cases, small sub-sets of data may be protected by commercial agreements; in other cases some data may have been released to close colleagues before the originators had time to consummate their prerogative to have a limited period (usually about two years) of exclusivity; in still other cases there may be legal constraints (imposed by some countries) that prohibit the public sharing of some climate data. The Investigatory Committee established that Dr. Mann, in all of his published studies, precisely identified the source(s) of his raw data and, whenever possible, made the data and or links to the data available to other researchers. These

actions were entirely in line with accepted practices for sharing data in his field of research.

With regard to sharing source codes used to analyze these raw climate data and the intermediate calculations produced by these codes (referred to as “dirty laundry” by Dr. Mann in one of the stolen emails) with other researchers, there appears to be a range of accepted practices. Moreover, there is evidence that these practices have evolved during the last decade toward increased sharing of source codes and intermediate data via authors’ web sites or web links associated with published scientific journal articles. Thus, while it was not considered standard practice ten years ago to make such information publicly available, most researchers in paleoclimatology are today prepared to share such information, in part to avoid unwarranted suspicion of improprieties in their treatment of the raw data. Dr. Mann’s actual practices with regard to making source codes and intermediate data readily available reflect, in all respects, evolving practices within his field. Dr. Mann acknowledged that early in his career he was reluctant to publish his source codes because the National Science Foundation had determined that source codes were the intellectual property of the investigator. Moreover, because he developed his source codes using a specific programming language (FORTRAN 77), these codes were not likely to compile and run on computer systems different from the ones on which they were developed (e.g., different processor makes/models, different operating systems, different compilers, different compiler optimizations). Since then, however, he has used a more accessible method for developing his source codes (MATLAB) and he has made all source codes, as well as intermediate data, available to the research community, thereby meeting and exceeding standard practices in his field. Moreover, most of his research methodology involves the use of Principal Components Analysis, a well-established mathematical procedure that is widely used in climate research and in many other fields of science. Thus, the Investigatory Committee concluded that the manner in which Dr. Mann used and shared source codes has been well within the range of accepted practices in his field.

The issue of whether Dr. Mann had engaged in any actions that seriously deviated from accepted practices within the academic community for *conducting* research or other scholarly activities was examined by the Investigatory Committee via a number of additional means. When a scientist’s research findings are well outside the range of findings published by other scientists examining the same or similar phenomena, legitimate questions may be raised about whether the science is based on accepted practices or whether questionable methods might have been used. Most questions about Dr. Mann’s findings have been focused on his early published work that showed the “hockey stick” pattern of climate change. In fact, research published since then by Dr. Mann and by independent researchers has shown patterns similar to those first described by Dr. Mann, although Dr. Mann’s more recent work has shown slightly less dramatic changes than those reported originally. In some cases, other researchers (e.g., Wahl & Ammann, 2007) have been able to replicate Dr. Mann’s findings, using the publicly available data and algorithms. The convergence of findings by different teams of researchers, using different data sets, lends further credence to the fact that Dr. Mann’s conduct of his research has followed acceptable practice within his field. Further support

for this conclusion may be found in the observation that almost all of Dr. Mann's work was accomplished jointly with other scientists. The checks and balances inherent in such a scientific team approach further diminishes chances that anything unethical or inappropriate occurred in the conduct of the research.

A particularly telling indicator of a scientist's standing within the research community is the recognition that is bestowed by other scientists. Judged by that indicator, Dr. Mann's work, from the beginning of his career, has been recognized as outstanding. For example, he received the Phillip M. Orville Prize for outstanding dissertation in the earth sciences at Yale University in 1997. In 2002, he received an award from the Institute for Scientific Information for a scientific paper (published with co-authors) that appeared in the prestigious journal *Nature*; also in 2002, he co-authored a paper that won the Outstanding Scientific Paper Award from the NOAA Office of Oceanic and Atmospheric Research, and *Scientific American* named him as one of 50 leading visionaries in science and technology. In 2005, Dr. Mann co-authored a paper in the *Journal of Climate* that won the John Russell Mather Paper award from the Association of American Geographers, and in the same year, the website "RealClimate.org" (co-founded by Dr. Mann) was chosen as one of the top 25 "Science and Technology" websites by *Scientific American*. In 2006, Dr. Mann was recognized with the American Geophysical Union Editors' Citation for Excellence in Refereeing (i.e., reviewing manuscripts for *Geophysical Research Letters*). All of these awards and recognitions, as well as others not specifically cited here, serve as evidence that his scientific work, especially the conduct of his research, has from the beginning of his career been judged to be outstanding by a broad spectrum of scientists. Had Dr. Mann's conduct of his research been outside the range of accepted practices, it would have been impossible for him to receive so many awards and recognitions, which typically involve intense scrutiny from scientists who may or may not agree with his scientific conclusions.

The third area of investigation was to address whether Dr. Mann had engaged in any actions that seriously deviated from accepted practices within the academic community for reporting research or other scholarly activities. Dr. Mann's record of publication in peer reviewed scientific journals offers compelling evidence that his scientific work is highly regarded by his peers, thus offering de facto evidence of his adherence to established standards and practices regarding the reporting of research. To date, Dr. Mann is the lead author of 39 scientific publications and he is listed as co-author on an additional 55 publications. The majority of these publications appeared in the most highly respected scientific journals, i.e., journals that have the most rigorous editorial and peer reviews in the field. In practical terms, this means that literally dozens of the most highly qualified scientists in the world scrutinized and examined every detail of the scientific work done by Dr. Mann and his colleagues and judged it to meet the high standards necessary for publication. Moreover, Dr. Mann's work on the Third Assessment Report (2001) of the *Intergovernmental Panel on Climate Change* received recognition (along with several hundred other scientists) by being awarded the 2007 Nobel Peace Prize. Clearly, Dr. Mann's reporting of his research has been successful and judged to be outstanding by his peers. This would have been impossible had his activities in reporting his work been outside of accepted practices in his field.

One issue raised by some who read the stolen emails was whether Dr. Mann distributed privileged information to others to gain some advantage for his interpretation of climate change. The privileged information in question consisted of unpublished manuscripts that were sent to him by colleagues in his field. The Investigatory Committee determined that none of the manuscripts were accompanied by an explicit request to not share them with others. Dr. Mann believed that, on the basis of his collegial relationship with the manuscripts' authors, he implicitly had permission to share them with close colleagues. Moreover, in each case, Dr. Mann explicitly urged the recipients of the unpublished manuscripts to first check with the authors if they intended to use the manuscripts in any way. Although the Investigatory Committee determined that Dr. Mann had acted in good faith with respect to sharing the unpublished manuscripts in question, the Investigatory Committee also found that among the experts interviewed by the Investigatory Committee there was a range of opinion regarding the appropriateness of Dr. Mann's actions. Opinions ranged from one expert who contended that it is never acceptable to share an unpublished manuscript without first obtaining explicit permission from the author(s) to do so, to another expert who felt that, when working with close colleagues, it is sometimes acceptable to do so by assuming that implicit permission had been granted. The Investigatory Committee considers Dr. Mann's actions in sharing unpublished manuscripts with third parties, without first having received express consent from the authors of such manuscripts, to be careless and inappropriate. While sharing an unpublished manuscript on the basis of the author's implied consent may be an acceptable practice in the judgment of some individuals, the Investigatory Committee believes the best practice in this regard is to obtain express consent from the author before sharing an unpublished manuscript with third parties.

The Investigatory Committee would like to note that Dr. Mann, after being questioned by the Investigatory Committee about this issue, requested and received confirmation that his assumption of implied consent was correct from the author of one of the papers in question. This "after the fact" communication was not considered by the Investigatory Committee in reaching its decision.

Conclusion of the Investigatory Committee as to whether research misconduct occurred:

The Investigatory Committee, after careful review of all available evidence, determined that there is no substance to the allegation against Dr. Michael E. Mann, Professor, Department of Meteorology, The Pennsylvania State University.

More specifically, the Investigatory Committee determined that Dr. Michael E. Mann did not engage in, nor did he participate in, directly or indirectly, any actions that seriously deviated from accepted practices within the academic community for proposing, conducting, or reporting research, or other scholarly activities.

The decision of the Investigatory Committee was unanimous.